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Manufacturing Chemist

Editor: W. G. Norris

Vol. XXXI, No. 5 MAY, 1960

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GLASS CONTAINER MANUFACTURERS INTRODUCE

FREE

Container-acceptance Testing Service

A new service designed to help Packers

Britain's Glass Container Manufacturers have introduced a new and forward-looking service for the packing industry. Appreciating that a need existed for a service which would enable Packers to test in advance consumer acceptance of new packs, they have set up a Container-acceptance Testing Service. This new service will furnish any Packer with facilities to pre-test his pack in any one, or all four, of the following progressive stages:—1 Design Preference Testing, 2 Container In Use Testing, 3 Shelf Testing, 4 Area Test Marketing.

Free Service

Because the glass manufacturers believe that this service should be used as widely as possible, all the facilities under headings 1, 2 and 3 are offered quite freely as a service to the packing industry. The only cost to the Packer under these headings will be in the supply of goods, containers and such items as labels and transport. In the case of Area Test Marketing schemes however, a nominal charge will be made for planning the operation.

Security

Where any of these tests are carried out on new products, the whole operation can be executed with absolute security, if this is desired. Packers can have complete anonymity by employing one of several brand names that have been registered especially for this service.

If you would care to have further details of this service, please do not hesitate to ask, irrespective of whether your interest is immediate or not. Your glass container manufacturer will be happy to discuss your problem and to help you in any way. Details of the operation of the scheme have been published as a booklet, copies of which are available on request.

1 Design Preference Testing

Facilities are available to pre-test the appeal and acceptability of new container designs on a consumer panel of 400 households in London, Birmingham, Manchester and Glasgow. From this panel a balanced sample can be drawn to match the known, or probable, consumer market for the product. The panel's reactions to the design will be recorded, analysed and presented to the Packer as a report and design recommendation.

2 Container in Use Testing

The consumers' attitude towards the new pack can be carried a step further than ascertaining the appeal of the design only. Any new glass container and the product for which it is designed can be tested in actual home use by the consumer panel. Their experience of how the pack and product measures up to the requirements of use in the home will be recorded, analysed and presented to the Packer as a report and design recommendation.

3 Shelf Testing

The sales appeal of a new design can be tested under actual store conditions. The pack will be placed on the shelves or counters of a number of self-service or other stores in the main centres of population. The speed and volume of off-take will be recorded and analysed by class of store and locality. The packed product can be tested either alone or in competition with any alternative or existing pack.

4 Area Test Marketing

Because the pack and product testing service is so closely associated with marketing, it was felt that a service which linked the two operations would furnish Packers with a valuable additional service. To this end an expertly staffed marketing service has been established which will plan, organise, and, if desired, execute test market campaigns in their entirety, on behalf of any Packer wishing to launch a new glass packed product.

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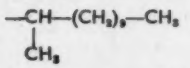
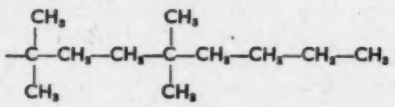
TOPICS AND COMMENTS

Detergents—end of the sewage problem?

THE problem of excessive foam interfering with sewage processes seems well on the way to being overcome. Foaming caused by synthetic detergents has given sewage engineers a great deal of trouble, and in some cases antifoaming agents have had to be used to control the nuisance. There has been a rapid rise in the consumption of synthetic detergents (in 1959 the total for the U.K. was 44,900 tons of surface-active material against 13,000 ten years before) so the nuisance has been increasing. The obvious answer was a new detergent material as effective as existing ones but more amenable to oxidation in the sewage works. Since the price had to be the same, primary alkyl sulphates, which otherwise meet the case, had to be ruled out because their use would add substantially to the price of washing powder. Some years ago C. Hammerton, senior chemist of the Metropolitan Water Board, found that alkyl benzene sulphonates are more readily decomposed by bacteria if the alkyl part of the molecule is of a simple straight chain configuration than if it is of a more complex branched pattern. In other words, compounds with structures such as



were more likely to be biologically soft than those with structures such as



This observation has been followed up and the Shell Chemical Co. have produced a dodecyl benzene with a relatively straight side chain which, in the laboratory, was destroyed by sewage processes to the extent of 94% compared with 68% for the old material. The new detergent base—*Dobane JN*—has been tested in the Luton and Harpenden areas since August 1958. In spite of the co-operation of detergent manufacturers, it has not been possible to replace more than 70% of the detergents used in the area with products based on the new material. Nevertheless there has been appreciably less foam on the rivers—the Lee and its tributaries—which supply London with a lot of its water. The experiments, conducted in secret for fear that the public would refuse to buy the new products, although they are otherwise identical with the old, are described in the Third Progress Report of the Standing Technical Committee on Synthetic Detergents published on April 21 (H.M.S.O., 1s. 6d.). The committee thinks that the widespread introduction of the new material would substantially diminish the troubles caused by the increased use of synthetic detergents, but they are not certain it provides the complete answer. Further research is being undertaken by Shell to improve the product. Meanwhile the Luton experiment is continuing in an attempt to cut down the entry of old material into the town. We understand that Shell are now supplying enough *Dobane JN* to meet a third of the country's detergent requirements. The demand will undoubtedly increase and it would appear that the new material has gained an overwhelming advantage over sucrose detergents which have frequently been mentioned as suitable biologically soft materials.

£300 million for research

THE latest estimate of industrial research and development expenditure produced by the D.S.I.R. is encouraging on three counts. Firstly there is an absolute increase—£300 million in 1958 against £190 million in 1955, secondly there is a considerable reduction of the amount spent on defence contracts, from nearly two-thirds in 1955 to less than half in 1958, and thirdly research expenditure expanded over a period in which the volume of production changed very little. Industry is undoubtedly spending more on research; expressed as a percentage of national production the 1958 figure was 4·2% against 3·1% in 1955.

The D.S.I.R. survey is estimated to account for over half the fully qualified scientists and engineers employed on research and development by industry. By improvements in technique the latest survey is thought to be much more reliable than the previous one and greater reliability is expected in the future.

The biggest spenders on research are the same three industries as in 1955, namely aircraft (£100 million), electrical engineering (£64 million) and chemicals and allied trades (£43 million).

A special effort was made to discover how the cost of employing a qualified worker on research had changed since 1955. This cost varies greatly from one industry to another and is related to the amount of development expenditure and the use made of supporting (not "fully qualified") staff. The average cost per annum of a qualified worker for all manufacturing industry was nearly £11,000. In the aircraft industry the figure was a staggering £31,000, but if this exceptional case is discounted the average for industry other than aircraft works out at just under £8,000. In 1955 the cost of a qualified worker

was £5,600 and the new figure thus represents an increase of 43%, of which 14-15% can be attributed to rising prices and incomes.

The chemical industry, including mineral oil refining, employed 20,476 people on research and development of whom 6,368 (31%) were qualified. Cost per qualified worker was £6,655, which is below the average. On the other hand, the cost of chemical research expressed as a percentage of net output was above the average. The net output of chemicals and allied trades was put at £734·9 million, so that the research expenditure was 5·9% of net output. In only three industries out of a total of 14 was this percentage higher, namely aircraft (35·7), electronics (11·9) and precision instruments (10·7). These industries probably get more defence contracts than the chemical industries.

About 5% of industry's r. and d. expenditure was paid to outside bodies—government departments and laboratories, co-operative research associations and universities. The chemical industries paid out £666,000 in this way, a small proportion of its total expenditure. Industries of small firms paid most to outside bodies, which is not surprising.

With a total r. and d. force of 113,500 of whom 26,225 are qualified, British industry seems to be taking very seriously the need to utilise the nation's brains to the full. We look forward to an intensification of the effort in the 1960s.

Three-D microscope

A MICROSCOPE which gives a three-dimensional image or luminous model of the object will be on show for the first time on the D.S.I.R. stand at the Instruments, Electronics and Automation Exhibition, starting at Olympia, London, on May 23. Designed by a team led by Mr. Richard Gregory at the Cambridge University Psychological Laboratory and supported by a D.S.I.R. grant, it is intended particularly for use in biological research. It should prove useful for examining living cells—perhaps bombarded with radiation for cancer research—and also thick sections of suitably strained brain tissue in order to see how the brain cells are related to each other. Apart from biological applications, the solid image might be a useful way of displaying nuclear tracks in blocks of emulsion for cosmic ray research.

Unlike the conventional stereoscopic microscope, which gives an appearance of depth by providing a slightly different picture to each eye, this new instrument gives a truly solid image projected into a cube of space.

When a thick specimen is under observation by a normal microscope, only a thin section of it can be in sharp focus for any one setting of the focusing screw and it is only possible to examine the complete specimen by focusing successively through the specimen. This limitation is actually put to use in the operation of the solid image microscope. The solid image is built up by vibrating the focusing mechanism up and down so that the thin plane of focus scans the object in depth. The constantly changing image given by the scan is then projected on to a screen which vibrates in precise synchrony with the object scan but with greater amplitude. The magnified image is formed in the cube of space swept by the vibrating screen. It is quite steady because the rate of scan is too high for the flicker to be seen.

The instrument thus has the important advantage over conventional stereoscopic microscopes that thick sections can be observed in depth. One disadvantage is that the solid image suffers from lack of contrast due to the ambient light in the cube space in which the image lies, and this can be serious.

It is possible to dispense with vibrating parts in favour of just two rotating optical elements mounted on a single shaft. This may prove a simple and effective way of providing solid images once the technical difficulties of making the special optical surfaces are overcome.

Smoker's delight

SMOKING and medicine are becoming very closely related subjects. Smokers who now have to pay 2d. more for a packet of cigarettes can only draw consolation from the fact that they are helping to pay for the extra cost of the Health Service; indeed it is estimated that the whole cost of the Service is now borne by the cigarette and tobacco duties.

Why does smoking claim so many addicts? According to the distinguished Oxford pharmacologist, Professor J. H. Burn, the pleasure of smoking may be the result of nicotine releasing micro-quantities of nor-adrenaline into the brain. He was speaking at a three-day conference of the New York Academy of Sciences devoted to the heart and circulatory effects of nicotine and tobacco smoking. He suggested that the release of nor-adrenaline in the brain is partly responsible for the "increased feeling of cheerfulness and a sense of relief from fatigue" experienced by the smoker.

Nor-adrenaline is made by cells in or near the skin, the heart, blood vessels and the brain. Nicotine causes the release of nor-adrenaline by these tissues. (The enhanced supply of nor-adrenaline in the brain is the presumed basis for the anti-depression action of the new "psychic energiser" compounds, and the reverse the reason for the tranquillising action of reserpine.)

The release of nor-adrenaline in the skin accounts for reduced blood flow in that tissue after smoking. Such release of the hormone makes the hair on a cat's tail stand on end when the animal is alarmed.

In another report Dr. Burn said that the more rapid beating of the heart after inhalation of cigarette smoke depended on release of nor-adrenaline in that organ after stimulation by nicotine. The smoker absorbs 35 to 60 mg. of nicotine per packet of cigarettes inhaled, depending upon his smoking habits, the conference was told.

Attack on accidents

PROMINENT chemical firms are among the 35 companies sponsoring the National Safety Contest. British Oxygen and the Distillers Co. signed the original trust deed of the Contest. It was launched on April 25 and will run until May 23. More than £1,000 prize money is being offered for safety ideas to cut down accidents at work, on the roads and in the home. At the H.Q. of the contest—36 Whitefriars Street, London, E.C.4—hundreds of safety ideas have already been received. More than a quarter of a million entry forms and 100,000 posters have gone out to factories, shops and local authorities all over the U.K.

The Contest dramatises safety. We can certainly do with positive thinking on this matter. The statistics are dreadful. Each year millions of industrial injuries, nearly 700 fatal, more than 8,000 accidental deaths in the home, and 6,500 deaths on the road with 70,000 more seriously injured victims. Incredible as it may seem, about 1,400 people die from accidental poisoning alone, and 700 from suffocation. In the last 50 years 8 million people have been injured on the roads and 250,000 killed. In the next 50 years at the present rate 15 million will be injured on the roads and 300,000 killed.

Because safety is a somewhat negative state of mind people seem to be resigned to this appalling prospect. The people who are running the contest, the chairman of which is R. Reader Harris, M.P., are doing a splendid job. Every art and device that can arouse people and make them more careful of themselves and others must be used if a halt is to be called to the misery, expense and waste of accidents.

Water for spacemen

THE two articles on effluent treatment in this issue will, we hope, help chemical factories to tackle their waste problems more effectively. But the most refined idea yet for waste treatment comes from the U.S. At the national meeting of the American Chemical Society a biochemist working for General Electric outlined to a somewhat startled audience a scheme for producing potable water from what he delicately called metabolic wastes. Where on earth would such a scheme be needed? The answer is, it is not needed on earth but in space. Yes, it's the answer to one more problem of the future generations of spacemen—how to provide themselves with drinking water in the cramped accommodation of a spaceship. We hear that the food problem has been solved by tablets and concentrated pastes squeezed from tubes. But what about water? How do you concentrate that? According to Mr. Bengson, the biochemist, you simply recycle it, converting excreta into pure water, drinking it and so on, not *ad infinitum* but at least *ad astra*.

Mr. Bengson says his process has the advantage of utilising two conditions found abundantly in space—vacuum and solar energy. Urine and fæces are distilled by using the vacuum in space and then passed through a high temperature catalytic zone heated by solar energy, where bacteria, odours and other toxic materials are destroyed. The process is claimed to extract 95% by weight of the water in the wastes and to regenerate it to "impeccable quality." Apparently it is regularly drunk in the G.E. Space Sciences Laboratory. "Laboratory workers will not bother to go across the hall to the water cooler when any of this uniquely produced water is available" commented Mr. Bengson. And "it cannot be distinguished from distilled water, but it can be distinguished from ordinary Philadelphia drinking water. It is of higher quality."

The research project is going ahead on two fronts. Animals are being fed with regenerated water for long periods to study the possible build-up of toxic materials. And the engineering parameters for the apparatus are being worked out.

We seem to remember a somewhat earthy description of this in the Bible. Is science catching up with yet another biblical prediction?

Journalist-chemist

JUST 100 years ago Walter Weldon, son of a Loughborough manufacturer, founded *Weldon's Register of Facts and Occurrences in Literature, Science and Art*, a "popular" monthly. Among early articles and essays were to be found "The Origin of Species Controversy," "Solar Eclipses," "Building Stones: Why they Decay," "Spectrum Analysis" and a host of papers on earthquakes, new gold ores, arsenic eaters and other topics to tease the appetites of readers. Weldon set out to cover everything of importance in literature, science and art. "In sciences it will record and describe every fresh discovery in every department of scientific research, every new scientific theory, and every new application of science."

Evidently the discoveries which this 27-year-old journalist "registered" had a powerful effect on him for we next hear of him creating a chlorine industry. He took out a patent for manganese recovery in his "Weldon Process" at a time when he had never heard a chemical lecture nor entered a chemical laboratory. The fact that Weldon (or his wife) founded also a fashion paper to be called *Weldon's Journal* was of less importance than that during the years that he was reviewing masses of scientific topics, he was also acquiring a wide theoretical knowledge of chemistry. Thus, within seven years of founding his journal Weldon discovered the manganese recovery process for ensuring economical working of an oxidation of hydrochloric acid to provide chlorine for a thriving bleaching industry. He had made contact with Colonel Gamble, an appropriate name for an industrialist ready to stake a fortune in the alkali trade of those days. Weldon demonstrated a soda-making process before Gamble and although it was of little promise and Gamble was hardly impressed, the contact enabled Weldon to experiment in the works

at St. Helens and to direct laboratory assistants to work his chlorine recovery ideas. With manganese recovered to an extent approaching 95% resulting in the price of bleaching powder being reduced by several pounds a ton, the journalist-turned-chemist suddenly impressed the chemical industry by his achievement. Dumas awarded Weldon a gold medal of the French Society of Chemical Industry with the claim that: "By Mr. Weldon's invention every sheet of paper and every yard of calico has been cheapened throughout the world." Weldon was in his heyday. France made him a Chevalier of the Legion of Honour, the Royal Society elected him to the fellowship in 1882, and he took a leading part in founding the Society of Chemical Industry. He had French connections in his close friendship with the chemical manufacturer Pechiney, and his name became internationally known, with every chlorine producer except two using the Weldon process. From his London journalism he had become a recognised expert in the alkali industry; a strange metamorphosis it may seem to some, yet no stranger than when Gamble changed from being Minister of the Kirk of Enniskillen to alkali manufacturer, or when Muspratt, fresh from his adventures in the Napoleonic wars, set up a do-or-die effort to work the Leblanc process.

Scar eraser?

An enzyme that might prove suitable for erasing scar tissues is being developed at the Children's Hospital Research Foundation, Washington. It is called pancreatic collagenase and it is described in a paper by J. C. Houck and Y. M. Patel, who work at the Foundation, in the *Proceedings* of the Society for Experimental Biology and Medicine (1959, **102**, 421).

It is a thermo-labile material present in whole activated pancreas and it is claimed that it can reduce by 50% both viscosity and ability to form fibres of acid-soluble collagen solutions. This activity is not affected by various trypsin inhibitors, nor is it duplicated by trypsin, elastase, chymotrypsin or hyaluronidase alone. The enzyme seems to be reasonably specific for acid-soluble collagen.

Dr. Houck informs us that experiments on the resorption of scar tissue were confined to a small number of laboratory animals and are yet to be confirmed. He anticipates that this work will be actively pursued during the next six months, after which possible applications to the treatment of human scar tissue will be examined. Somewhat optimistic reports appeared in newspapers after Dr. Houck presented a paper to the American Chemical Society, but the purpose of this was to provide evidence for the existence of a hitherto unknown enzyme in the pancreas, this being the first animal collagenase reported. It is too early to decide that what appears to work in animals is likely to work in humans. Should the new enzyme prove suitable for human use it will be a big step forward in the management of disfiguring injuries and wounds.

Aerosolmania

If you can't sell it in a bottle or can, put it in an aerosol. This seems to be the philosophy that has so dramatically swollen the range of aerosol products in the United States. If their experience is a guide to trends in this country we shall soon be knee-deep in aerosol packs. The five most popular aerosol products in the U.S.—according to Dodge and Olcott—are hair sprays, room deodorants, shaving lathers, insecticides and insect repellents. All are logical choices for pressure dispensing. But can the same be said for sauces, syrups, batter, cheese spreads, charcoal lighters, athlete's foot lotion and vitamin products? The last item is particularly curious; what can be the reason for administering vitamins as a spray?

Reading the catalogue of aerosol packs one gets a distinct impression that in several cases it is novelty and not utility that is sought. That seems a pity, for misapplication is a sure way of discrediting a very useful invention. It would be wrong to give the public the impression that aerosols are just an excuse for a fancy pack and a high price.

Maladies of the immortals

The afflictions and illnesses of the great have a fascination for ordinary mortals. It is one of those touches of nature that makes the whole world kin. Was Waterloo Wellington's victory or Napoleon's failure and if so was the fate of the Emperor sealed because of the exhausting and agonising attack of hæmorrhoids that prostrated him on the eve of the battle? Was he an epileptic or a victim of hypopituitarism? These are some of the questions elucidated by James Kemble, a urologist, in a new book *The Medical History and Private Life of Napoleon Bonaparte*. His conclusion is that for a man subject to immense stress he enjoyed surprisingly good health until his premature death on St. Helena from cancer of the stomach.

Another book on the maladies of the famous is *Shakespeare and Medicine* by R. R. Simpson. This is not concerned with Shakespeare's medical history but with his amazingly profound knowledge of disease which is a constant source of wonder to students of his plays. Mr. Simpson has collected no fewer than 700 medical references in Shakespeare's works and classifies them under 20 headings. Shakespeare often used a medical image to illustrate a point or a medical situation at a moment of dramatic intensity. The death of Falstaff in *Henry V* is an extraordinarily percipient description of typhoid and in *Timon of Athens* there is a description of syphilis. Did Shakespeare acquire his medical knowledge from his son-in-law, Dr. John Hall, who practised in Stratford? Mr. Simpson thinks not, pointing out that there are almost as many medical references in the plays and poems before Shakespeare met Hall in 1600 as there are in subsequent works. Shakespeare's medical knowledge must be accepted as yet another manifestation of his supreme genius.

Pharmaceutical Manufacture in the 1960's

Merck Sharp and Dohme's New Factory at Hoddesdon

By W. G. Norris

At Hoddesdon, Hertfordshire, about 20 miles north of London, Merck Sharp and Dohme Ltd. have brought into production a £700,000 factory. It embodies advanced ideas in materials handling and pharmaceutical manufacture and is splendidly equipped for the large-scale production of tablets, powders, lotions, ointments, liquids and sterile injections. Here is a description of this factory which sets a standard for the pharmaceutical industry of the 1960's.

View of the new factory from the main Hertford road.

THE completion of the £700,000 pharmaceutical factory of Merck Sharp and Dohme Ltd. at Hoddesdon, Herts., is the culmination of a project that has been cherished since the Battle of Britain. In the night of September 3, 1940, exactly one year after the start of the war, the five-storey factory of Sharp and Dohme Ltd. in City Road, London, E.C.1, was bombed to the ground. Nothing was salvaged except the nameplate.

The man who cherished the dream that is now realised at Hoddesdon was Thomas W. Rayner, head of Sharp and Dohme Ltd. and now managing director of Merck Sharp and Dohme Ltd. He has run the company since 1928, when he returned to London from the United States to establish the English subsidiary of the H. K. Mulford Co., which later merged with Sharp and Dohme Inc.

In 1953 Merck and Co. Inc., famous as fine chemical manufacturers since the seventeenth century, when the German ancestors of the business opened a pharmacy in Darmstadt, took over Sharp and Dohme, which began in Baltimore in 1845. Merck wanted to exploit its own chemical inventions instead of simply selling fine chemicals to the pharmaceutical industry; Sharp and Dohme supplied the necessary mer-

chandising experience; and so was born the Merck Sharp and Dohme division of Merck and Co. Inc., which incidentally is an entirely American company, having severed its ties with Germany in 1914.

The effect of this merger on the company managed by Mr. Rayner was to add the name of Merck to it and to pump a lot of experience and money into the development of the Hoddesdon site. Another repercussion was the purchase of the 136-year-old fine chemical manufacturers, Thomas Morson and Sons Ltd., at Ponders End, Middlesex. This reproduced in England the Merck pattern of linking fine chemicals manufacture with pharmaceutical processing and merchandising. Morson's supply MSD with part of their fine chemicals requirements, but otherwise the companies operate separately in their own different lines of business. Control is exercised through Mr. Rayner, who is chairman of Morson's.

A £700,000 factory employing 350 people is a sizeable project, but to bring it into perspective it should be noted that Hoddesdon (including Morson's) was responsible last year for 17% of the 63 million dollars turnover of the MSD International Division. This, in turn, was 29% of the company's total sales of 216·9 million dollars. During recent years as much as 30% of the English companies' output has gone to export markets. The investment in the U.K. is about £1½ million and Merck's total net assets abroad—it has 15 overseas factories and branches—amount to about £14 million, and are increasing year by year.

The main products at Hoddesdon are tablets—the factory turns out about 600 million a year. Then there are elixirs, lotions, ointments, creams, injectables and medicated sweets. Currently the most important products are *Saluric* (chlorothiazide tablets), *Hydrosaluric* (hydrochlorothiazide tablets) and *Hydrosaluric K* (a combination of hydrochlorothiazide and potassium chloride). These are different versions of the successful chlorothiazide diuretic developed by Merck about two years ago. Other major products recently introduced are *Benemid* (probenecid tablets), *Cogentin* (benztropine methane sulphonate tablets), *Decadron* (dexamethasone tablets), *Inversine* (mecamylamine hydrochloride tablets), *Sulfasuxidine* (succinylsulphathiazole tablets and powder) and *Sulfathalidine* (phthalylsulphathiazole tablets and powder). Steroids such as prednisolone, prednisone and cortisone acetate, vitamins, antibiotics, sterile injections and veterinary medicines complete the current range of over 80 MSD products.

Design and construction

When the new factory was planned, some three years ago, one of Britain's foremost architects, Edward D. Mills, was commissioned. He was responsible for the design of the British Pavilion at the Brussels Fair, and has designed a number of pharmaceutical factories, including May and Baker's at Dagenham. Readers may remember the series of articles on factory design which he published in MANUFACTURING CHEMIST.* He had to tackle the physical peculiarities of the site which, although immediately adjacent to the Hertford Road, is 27 ft. below it, being in fact a disused gravel pit. Although it covers 5 acres, much of the site was occupied with the Nissen huts in which manufacture had to be improvised during and immediately after the war. As a result it was impossible to follow the favoured trend and build a single-storey factory. A three-storey reinforced concrete building was decided upon. It measures 200 ft. by 120 ft. and provides 78,000 sq. ft. of floor space. To overcome the serious problems of materials handling inseparable from multi-storey buildings, no fewer than three lifts have been installed. Two are goods lifts, each 10 ft. cube and of 5 tons capacity, and the third is a passenger lift. They are placed at the south end of the building with the intention that eventually they will be in the centre of a building measuring exactly 200 ft. by 240 ft. In anticipation of this extension to the south, which is planned as part of a 10-year expansion programme, the south side is clad with curtain walling which is easily removable.

To project the "corporate image" of a modern, highly efficient pharmaceutical factory, the curtain walling consists of large clear windows with white, vitreous enamel sheet steel in large panels, the whole supported on pre-cast concrete black edge beams. The effect is a clear geometrical pattern of black and white. Two lift towers and two stair towers serve as rigid stabilisers to the main building frame. The staircase facing Hertford Road is built on the outside wall where it does not intrude into the working space. It is faced with red tiles and carries the name sign, presenting a bold and distinctive focal point.

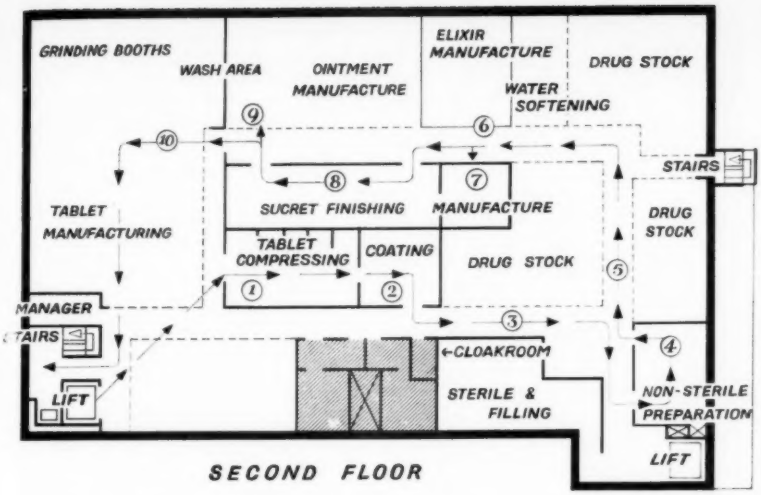
The first floor is level with the road, so the opportunity has been taken to place the filling and packaging lines on the side nearest the road, thus presenting a vista of clean, modern manufacturing activity to passers-by. Outbuildings such as garages, water tank (placed over the garages), fuel tanks and spirit stores have been tucked between the main building and the road where they do not obtrude into the general view. By landscaping and other means the rural surrounding are preserved as much as possible.

Full advantage has been taken of the possibilities for gravity flow inherent in a multi-storey building. Instead of circulating materials laterally as in a single-storey building, materials flow upwards to the manufacturing floor and down through the packaging floor to the ground floor for warehousing and dispatch. The ground floor is 21 ft. high so that goods can be stacked three pallets high. Lorries drive straight into the building to unload raw materials by fork-lift trucks. There are no loading ramps. From the ground floor materials are taken to the top by fork-lift trucks which drive straight into the bulk goods lift to ascend to the top floor. Finished goods are trucked down in the other lift. Handling is thus cut to the minimum.

The second outstanding feature of the factory is the services. Steam, hot water, compressed air, vacuum, demineralised water, distilled water, fuel storage, electricity transformers, etc., are provided by two sets of units. If one unit should break down the other is switched on automatically, and there is sufficient reserve to keep production going by scheduling demand. Space and piping connections are provided for the installation of a third set of service units to supply the extension to the factory when it is built. Steam is generated by two oil-fired boilers each rated at 5,275 lb. steam per hr. at 100 p.s.i., which work at high efficiency at varying loads.

The main service pipes—all colour coded to British Standard specification—run from the plant room and the boiler house through a central duct linking the bottom to the top of the building. The services are distributed to points on each floor through holes in the main supporting

* The Planning of Factories, MANUFACTURING CHEMIST, 1945, 47, 94, 127, 206, 242, 286, 358, 404, 444.



Plan of the top floor. The other two floors are the same size.

beams and columns which also encase the roof drainage pipes. This improves the attractiveness of the large clear areas on each floor which are created by the omission of all partitions except those necessary for enclosing air-conditioned rooms.

Heating and air-conditioning

Different types of heating systems are used for varying work requirements, namely radiant steam panels in the dispatch bay, convectors in offices, embedded electric elements in the remote gatehouse, and hot-air heating in the warehouse and production areas.

An unusual system for combined hot-air heating, ventilating and filtering is installed in the general working areas. Variable speed blowers and damper settings allow adjustment for summer cooling. Each floor is divided into five zones which are heated by steam unit heaters circulating air through acoustic lined ducts and diffusers. The air is passed through Fibreglass filter units to maintain the high standard of cleanliness required for pharmaceutical processes.

All manufacturing areas are designed for fume and dust-free operation. The tablet coating and grinding operations have filtered extract systems. In other operations the emphasis is on controlling dust at the generating sources.

Full air conditioning is provided in many manufacturing and packaging areas. The installation operates on a Freon 12 refrigeration plant and chilled water circulating from a forced draught cooling tower. Cooling coils are adjacent to the air-conditioned rooms in the plant equipment areas. Low humidity conditions for hygroscopic products are maintained by an activated alumina dehumidifier.

Comfort temperature control and air filtration are standard for all areas. In addition, the air supply to the sterile department passes through absolute filters and is irradiated with ultra-violet light to reduce the bacterial count.

Each floor has a plant equipment area on the mezzanine above the lavatories which encloses the service duct rising in the centre of the building. This "stacking" of services in the central area provides full use of building headroom and economises on installation and operation.

Manufacturing

There are seven main manufacturing sections on the top floor: tablet manufacturing, compressing, coating, ointment manufacturing, liquid manufacturing, sterile products, and "SUCRETS" production unit.

Active ingredients and excipients for tablets are mixed and then ground in mills in front of paint spray type booths to control the dust. They are granulated and then dried in hot-air ovens. The granules are ground again and lubricants are added in a drum roller. There are seven compressing machines ranging in capacity from 5,000 to 83,000 tablets per hr. There is also a compression coating machine with an output of 22,500 tablets per hr. used mainly for *Codelprone* (prednisolone-meprobamate) tablets. It is of interest to note that Sharp and Dohme in America developed the press coating process in 1928 which has since been incorporated in modern press-coating machines. The tableting machines are transportable and each is located in a separate cubicle for product control. Most tablets made are uncoated, but five coating pans ranging from 3 ft. to 5 ft. in diameter are used for sugar and enteric coating. The largest pans accommodate a quarter of a million tablets. The latest product, *Hydrosaluric K*, consists of a core of potassium chloride which is enteric coated with a new type of plastic instead of shellac. The enteric-coated core is pan-coated with hydrochlorothiazide in sugar. The tablet areas are fully air-conditioned.

There are two sterile areas for the manufacture of parenterals such as cortisone, hydrocortisone and prednisolone-neomycin. All vials, stoppers and seals are washed repeatedly in demineralised and distilled water. Containers and clothing are sterilised by autoclave or dry heat oven. Operatives enter through a series of separate dressing, washing and gowning rooms. All air is filtered and ultra-violet lamps are placed over all doors and in cubicles. Air circulates in the sterile areas through the ceiling and sweeps downwards and upwards over the filling tables, being drawn out behind baffles that skirt the edges of the rooms. Liquids for injection are prepared from pyrogen-free water which is subsequently sterilised by filtration.

In a combined production area, ointments are made in 50 gal. mobile stainless steel tanks and liquids are made in 500 gal. stainless steel tanks and 300 gal. glass-lined tanks which are centrally controlled and mechanically loaded. Active ingredients are milled to a critical particle size, the mills being fitted directly over the mixing tanks. Prepared liquids flow down stainless steel pipes to the packaging department on the floor below.

The mixed-bed demineralisation plant is adjacent to the ointment area.

Unusual in a pharmaceutical factory is the miniature sugar boiling plant for making "SUCRETS" (boiled lozenges medicated with hexyl resorcinol). Flavouring oils and antiseptic are added in the boiling stage. The hot mixture is cooled on a metal table and fed through high-speed dies to form the sweets. These pass through a wall into a rotary cooler

Coating pans: the two on the right are 5 ft. diameter.

and in this room they are sorted and individually wrapped in foil. Each wrapping machine handles 120-140 sweets per min. Temperature and relative humidity of the air are strictly controlled and the "SUCRETS" are packed in vacuum tins. When a similar product, *Tetrazets*, is made, the antiseptic is replaced by a tyrothricin-bacitracin-neomycin mixture.

Finally, on the top floor there is the drug stock department where all raw materials are measured out for each batch and delivered to the right department. Production is planned three months ahead and stocktaking is done continually.

Packaging

The main packaging hall provides a magnificent clear area 200 ft. long by 120 ft. wide. The huge expanse of ceiling is made of suspended sound-absorbing tiles and it is thought to be one of the largest of its type. The floor is covered with thermoplastic tiles, light green for the main area with "corridors" of non-marking black tiles for the passage of trucks. All 80 operatives on this floor are supplied with canvas shoes soled with natural rubber to keep the floor free of marks. The production manager and supervisors have offices on this floor and there is also a tea room.

The whole vast area is air-conditioned and is well lit by huge windows and recessed fluorescent lights.

There are seven packaging lines; three are for general purposes, one is for automatic liquid finishing and filling, one for *Tyrozet* lozenge manufacture and finishing, one for automatic tablet finishing, and one for ointment finishing. Most of the capping machines. Meanwhile the cartons have been labelled and passed to the end of the line on an overhead conveyor ready to receive the filled bottles.

Ointment filling and packaging is carried out in a similar sequence, except that in this case tubes are blown out with air to de-dust.

The tube-filling equipment for *Tyrozets* lozenges was designed and built in the company's own workshops.

On the packaging floor is the central department from which all labels are issued, each overprinted with the batch number. This number is issued by the control department and is linked to the packaging and production orders for each batch. This number identifies the

Tableting machines in their cubicles.

equipment is portable to give the flexibility needed for short and varied runs. Label glue has been dispensed with and thermoplastic labelling is used throughout. The sequence for tablets is: automatic bottle unscrambling, electronic counting and batching, filling into bottles, automatic insertion of cotton wads and capping with roll-on pilfer-proof seals or snap-on polythene caps with aluminium seal. The bottles are inspected, labelled and cartoned.

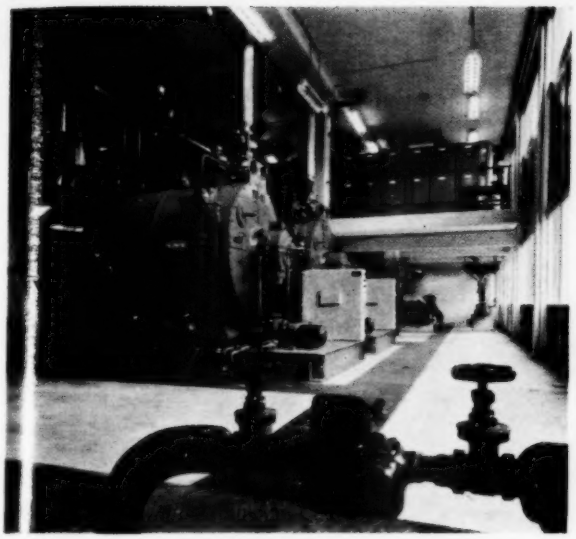
On the liquid filling line the product is piped from the manufacturing floor to the filling machine. Bottles arrive already washed in MSD shipping containers. They are blown out with air to remove paper dust and go straight into the filling and analytical tests, formula and processing for any and every item that leaves the factory.

Each filling and packaging line is located in a 20 ft. wide bay to keep products separate. Checkers and laboratory assistants are thus helped to supervise count, weight, closure and labelling for all products.

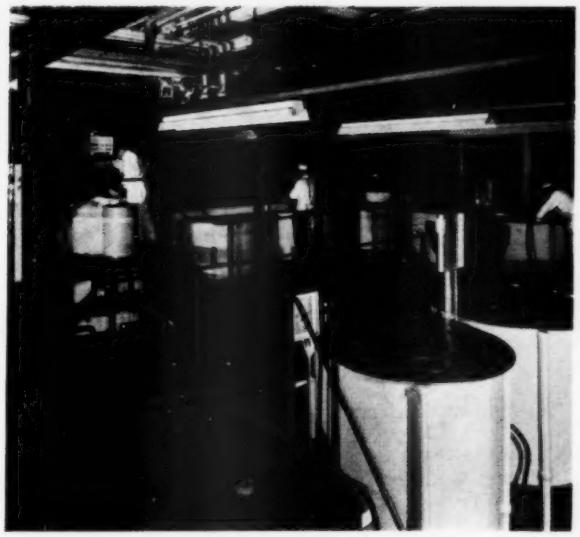
Warehousing and dispatch

On the ground floor there is a security area in which goods are stored and dispatched either by MSD lorries or by post. A roller conveyor is used for assembling orders in fibre-board nesting trays. Standard cartons are provided for postal orders.

The boiler house and plant room are also on the ground floor.



'Powermaster" oil-fired boilers in the plant room.



Mixing vessels on the top floor.

Control department

All manufacturing activities are supervised by the control manager and his staff, who test materials and finished products and issue the formula for each batch of product made. There are a microbiological laboratory and media kitchen for antibiotic and vitamin testing and a physical laboratory and balance room for the usual tests of viscosity, surface tension, solubility, refractive index, flame photometry, etc. These tests are supplemented by classical methods of analysis in the chemical laboratory where all raw materials and finished products are tested.

The last section of the Control Department is the sample store containing samples of every batch of raw material used and every product manufactured over the preceding five years. The score to date is 20,000 samples.

This total will certainly increase in the next five years because MSD now have ample capacity to meet all immediately foreseeable demands, both in the U.K. and in its score of export markets. With the backing of the parent company, which is currently spending over £7 million a year on research and development, this new and beautifully equipped factory can look forward to a prosperous future.

Bottle filling line. The MSD shipping cartons in which the bottles arrive pass overhead to receive filled bottles.

Contractors and Suppliers

Architect: Edward D. Mills and Partners.
Builders: Holland, Hannan and Cubitts Ltd.
Tableting machines, press coating machine, coating pans, granulator, tablet mixer, Fitzpatrick mills:
Manesty Machines Ltd.
Stainless steel vessels, steam kettles, stainless steel benches:
T. Giusti & Sons Ltd.
Mixers:
Gardner & Sons (Gloucester) Ltd.
Alite Machines Ltd.
Peerless & Ericson Ltd.
Stainless steel pumps and filling machines:
A. J. Manning Ltd.
Glass-lined tanks:
Enamelled Metal Products Ltd.
Sieves:
Russell Constructions Ltd.
Dust extraction booths:
H. K. Kunz Ltd.
Coating pans:
C. E. Skerman Ltd.
Apex Construction Ltd.
Glass water stills:
Loughborough Glass Co.
Sugar boiling plant:
Baker Perkins Ltd.
Autoclave:
Manlove Alliott & Co. Ltd.
Electric steriliser:
Charles Hearson & Co. Ltd.
Electronic tablet machines:
C. E. King & Sons Ltd.
Tube fillers:
Kalix Dupuy.
Weighing equipment:
Avery.
Label overprinters:
Tickopress Ltd.
Anglo-Continental Machines Ltd.
Thermoplastic labels:
Enderbys, St. Ives.
Heatfix labelling machines:
Rawsons (Labelling Machines) Ltd.
Boilers:
G.W.B. Furnaces Ltd.
Lifts:
Hammond and Champness Ltd.

TREATMENT OF CHEMICAL WASTES. *Pindar said, " The best thing is water," and today in Britain the authorities, reinforced by steadily awakening public opinion, are taking increasingly severe steps to prevent the pollution of waterways by trade wastes. Generally the chemical industry measures up to its obligations to reduce pollution to a minimum and is spending large sums on plant and neutralising treatments for its wastes. While it is true that every effluent problem is unique, much can be learned from the experience of others. Here we present two authoritative articles which describe how effluent treatment problems have been successfully tackled in two factories producing widely differing products, laboratory chemicals on the one hand and pest control chemicals on the other.*

Effluent Treatment at a Fine Chemicals Factory

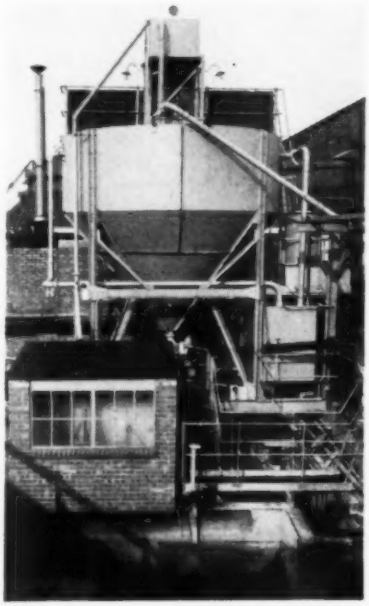
By D. H. Bell,* B.SC., F.R.I.C.

Effluent treatment at B.D.H. Laboratory Chemicals Works at Poole, Dorset, is complicated by the great number and variety of chemicals manufactured, which run into thousands. The effluent has to be discharged to the sea in a harbour which is much used for yachting and fishing. This necessitates a high standard of control. Here is a description of the plant now successfully in operation.

SOME years ago it was foreseen that existing effluent disposal arrangements at B.D.H. Laboratory Chemicals Division factory would in time become inadequate owing to increased output. In particular the sedimentation tanks were likely to be too small and an undesirably large amount of detailed supervision was needed in controlling methods of effluent disposal from individual jobs. Certain toxic wastes such as cyanides, etc., have always been treated separately and it was envisaged that such arrangements would have to continue, but it was hoped that a more centralised treatment would be possible for other effluent. The account which follows describes briefly the experimental work necessary for the design of the treatment plant together with a description of the plant.

The problem

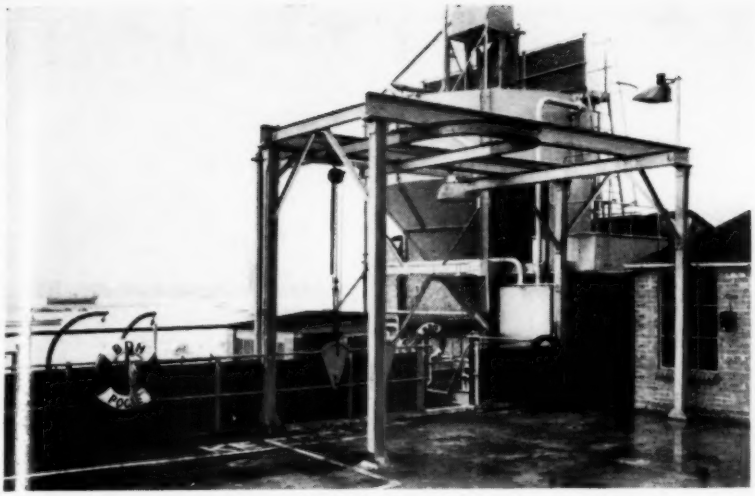
The conditions as described below will be seen to be unusual in some respects. In most cases, although an effluent may be objectionable and large in amount, there are a limited number of fairly well-defined products to be removed or chemically treated before the effluent is satisfactory for disposal to sewer, stream or open water. In some cases the matter removed is valuable and the value of the recovered products will help to pay for the cost of treatment. In this case, however, conditions are very different. Many thousands of products are handled, most of them to a very high standard of purity involving the use of large quantities of very pure water. The quantities of material involved are, by ordinary standards, small, and operations are carried out in batches rather than by continuous processes. Plant is of a general nature and in the course of a week any particular piece of plant may have as many as 10 or more different chemicals processed in it. The amount of effluent to be disposed of is small by comparison with that from many chemical works, amounting to about 750,000 gals. each 24 hr., of which somewhat less than 10% is contaminated. A considerable proportion of the contaminants are innocuous. The amounts of material discarded to waste are in most cases very small, both because the scale of operations is small and because in many cases expensive raw materials are involved. In no case is it practicable to recover from the mixed effluent any material of value to offset against the cost of treatment. Very few of the individual effluents would of themselves constitute a danger or even a nuisance, but the total effluent warrants treatment.



This view of the plant shows how the best use had to be made of a limited space.

Production goes on continuously throughout the 24 hr. for five days a week. Rates of flow vary widely and the nature and quantity of impurities fluctuate widely and in some cases rapidly. This suggests that one method would be to segregate those effluents which might give rise to trouble and treat each of these on the spot by suitable means such as neutralisation, precipitation or chemical change to some innocuous product. But, with hundreds of chemicals in production at any time and with a continually changing programme of production, this would entail an undue amount of detailed supervision and be very costly in terms of chemicals required for treatment. Furthermore it appears that no continuous treatment of combined effluents would be possible, the treatments required are too varied, and very large quantities of chemicals would be required for treatment. Discharge to the local sewers is not possible, they are too small. It is therefore necessary to

* Production Manager, B.D.H. Laboratory Chemicals Division.



A view of the effluent treatment plant overlooking Poole Harbour.

discharge to a small bay which is tidal and which is part of a large harbour much used for yachting and fishing.

Nature of effluent

The effluent can be broadly divided into four categories:

(1) Cooling water—both sea water and water from the public mains. This is uncontaminated.

(2) Water contaminated by a variety of products, some of which are objectionable.

(3) Pure water used for final rinsing of vessels to ensure complete freedom from minute traces of impurities on changing from one job to another. This is virtually uncontaminated. In many cases precipitates are washed with very large quantities of pure water for removal of quite small traces of innocuous water-soluble matter. This water also is virtually uncontaminated.

(4) Small quantities of water, which although harmless could be described as having a nuisance value, *e.g.* rinsings from vessels used in the preparation of pure stains and indicators where quite small amounts have a high tinctorial value.

A survey of all jobs and of the drainage system of the works was undertaken. This showed that without great difficulty the uncontaminated and the contaminated water could be segregated in most areas. This would enable a smaller purification plant to be built—this is important since space is limited. It also provides economy in treatment and pumping, etc. The buildings and plant are very little elevated above high water level and, therefore, pumping is resorted to at some stage even if discharge of effluent takes place at low tide only, which would be undesirable in any case.

A sampling device was installed in the main effluent pipe of the old plant enabling a continuous aliquot of the flow to be withdrawn. This liquid was collected and impounded for various periods ranging from 4 to 24 hr. Although a period of 24 hr. presented some advantage over the shorter times, this was ruled out by reason of the size of the tanks required and the lack of space referred to elsewhere. An 8 hr. period had the advantage that it coincided with the shifts worked and enables one man on each shift to operate the plant, carrying out the requisite duties and keeping records.

Trial runs

As tests proceeded it soon became evident that an empirical approach was necessary; for example, a search of the literature revealed a wide diversity of opinions as to the best design of sedimentation tank. It was also evident that much of the data recorded was based on the sedimentation of domestic sewage. Trial runs on a bench-scale pilot plant established the fact that the solids involved in our processes do not in general behave similarly. Continuous and intermittent sampling of the effluent over periods of 30-60 days confirmed the view that great variations in quantity and quality occurred, but that impounding over a period of even 8 hr. greatly facilitated treatment. High and low *p*H values were smoothed out and many metallic and other impurities were precipitated by interaction of the various anions and cations; for example, barium, lead and iron were precipitated by phosphates, sulphates, etc.

A small-scale pilot plant was constructed and aliquots of the main effluent treated as described below. In all cases continual stirring was carried out. The effluent was impounded for periods of 24 hr. and 8 hr., rendered alkaline (*p*H 9·5) by the addition of milk of lime, and any chemicals necessary for further treatment were added. In some cases addition of lime was not necessary to raise the *p*H to 9·5, but in these cases the addition of some lime was often found to be beneficial as it appeared to improve sedimentation. After 30 mins. the liquid was pumped to various types of sedimentation tank.

The maximum rate of flow for a clear effluent was determined for each type of tank. It was established that, in general, sedimentation was improved if freshly precipitated material was mixed with matured sludge, and the flow was arranged so that a very small amount of turbulence was maintained at the surface of the sediment.

Somewhat contrary to expectation a rectangular tank with "under and over" baffles, see Fig. (1A) was

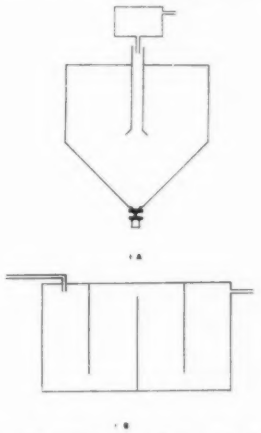


Fig. 1. The rectangular tank A was found to be more efficient than the cylindrical type B.

found to be considerably more efficient than the cylindrical type (1B), but the latter form was chosen since it was more easily and cheaply constructed and moreover rendered the removal of sludge easier. Difficulties were encountered in removing the right amount of sludge from the

various compartments in the rectangular form of tank. The clear liquor was titrated and treated with sufficient hydrochloric acid to reduce the *p*H to about 8·2. This figure was chosen since this is the *p*H of the water in the bay to which the effluent is discharged. Analyses were made of samples at all stages, and it was apparent that a satisfactory degree of purification could be effected along these lines and that clarification would be satisfactory by sedimentation without recourse to filters. The sludge contained about 6% solids. Further settling for a week only raised the solid content to about 8%. The sludge was at all times quite fluid and this was considered an advantage; it could be easily drawn off from the bottom of the sedimentation tank and removed by suction to a road tanker for disposal. No experiments therefore were carried out on dewatering of the sludge.

A somewhat larger pilot-scale plant was then constructed (capacity 100 times) and the experiments repeated. Similar results were obtained and it was therefore decided to go ahead with the construction of a full-size plant together with the necessary alterations to the drainage system.

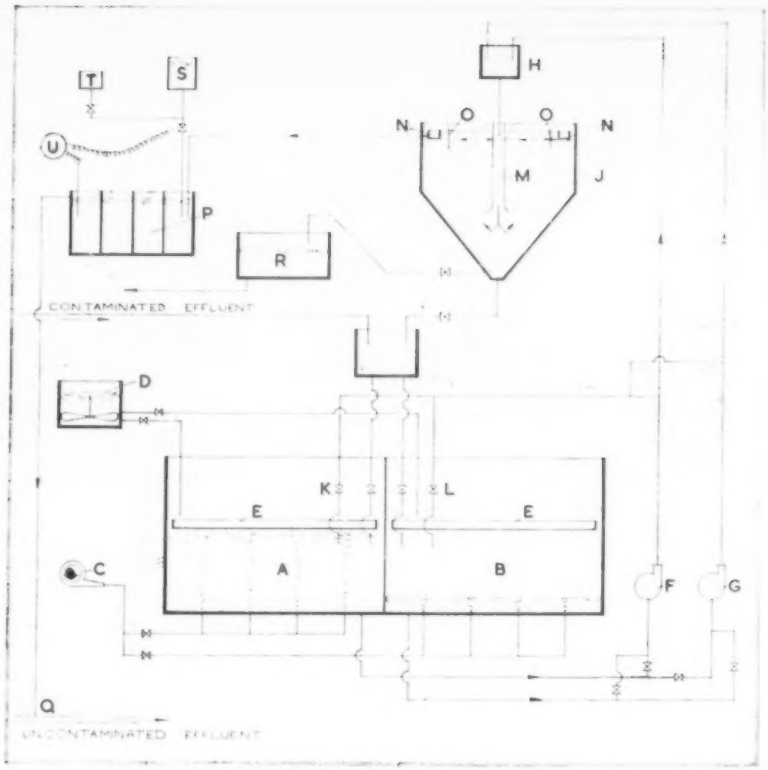


Fig. 2. B.D.H. Effluent Treatment Plant.

A, B, Impounding tanks. C, Air compressor. D, Lime slurry tank. E, Perforated trough. F, G, Pumps. H, Break tank. J, Sedimentation tank. K, L, Bleed-off valves. M, Annular tube surrounding feed pipe. N, Annular trough. O, Annular skirt. P, Baffled tank for *p*H adjustment. Q, Junction of treated effluent and uncontaminated effluent. R, Sludge tank. S, Hydrochloric acid supply tank. T, Hydrochloric acid supply tank (stand-by). U, *p*H control and recording unit.

The treatment plant

A description of the treatment plant (Fig. 2) follows, together with comments on various details of design, many of which had to be settled by trial and error. Reference has been made to the limited space available when the plant was built. A disused boat launching slipway existed and since it had been already agreed that a wall was to be built at the seaward end of this it was decided to amalgamate this operation with the construction of the impounding tanks. The sea-wall provides one wall of the tanks and in addition a good deal of excavation was obviated.

The tanks A and B (Fig. 2) are constructed of reinforced concrete. The interior surfaces are rendered and coated with a *Neoprene* paint. An examination of an old tank of similar construction which had been in use for many years on effluent of the same kind showed that very little attack was to be expected either from acid or alkaline effluent.

Continuous agitation of the contents of the impounding tanks is effected by blowing air through porous ceramic tiles 12 in. square placed at approximately 6 ft. centres over the bottom of the tanks, each tile being connected to a compressed air point fed from buried plasticised P.V.C. tubing. This method of agitation has the advantage that it oxidises certain contaminants—for example, ferrous salts—thereby facilitating precipitation and sedimentation. It also affords a certain amount of oxygenation of the water.

Air is supplied from a rolling drum type of compressor (C) rated at 75 c.f.m. at 10 p.s.i. driven by a 10 h.p. electric motor. The incoming contaminated effluent is strained through ¾ in. mesh wire screens to remove coarse debris and avoid blinding of the filters on the suction lines to the pumps. The requisite quantity of calcium hydroxide is added in the form of a thin slurry prepared as required in a cylindrical mild steel tank (D) provided with a slow-speed stirrer driven by a 1½ h.p. motor. Distribution to the impounding tanks (A and B) is by means of a perforated trough (E) running the length of one of the walls in each tank. After the addition of the lime the contents of a tank are found to be homogeneous after less than 10 min. agitation.

The pump house is built in the main tanks with the pumps (F and G) at the level of the tank bottom, thus providing drowned suction at all times. Each pump has a capacity of 4,000 gals. per hr. at 30 ft. head and is driven by a 5 h.p. motor. Either pump can pump from each tank at will. In the event of a pump failure visible and audible warning is given and change over to the other pump is effected manually.

Adjustment of the rate of flow to the break tank (H) above the sedimentation tank (J) is effected by a bleed-off valve (K and L), the flow from which returns to the impounding tank. This arrangement is preferable to throttling in the delivery line, since it lessens the possibility of sediment being deposited in the pump or in pipelines or valves.

The optimum size of orifice at the base of the break tank was found by trial. When the orifice is too large a very objectionable vortex is produced which entrains much air and seriously impairs sedimentation. When tank (A) is full contaminated effluent is diverted to tank (B). The contents of tank (A) are sampled and tested. The requisite quantity of lime is added as described above together with any other chemicals required for treatment.

After a lapse of 15 min. to ensure thorough mixing, the contents of tank (A) are pumped to the sedimentation tank (J) via the break tank (H). Sedimentation is sensitive to several factors in the tank other than the rate of flow. The height of the base of the annular tube (M) above the sludge is important to ensure just sufficient turbulence to mix any sediment with matured sludge, see above. It was found that a good flow path through the tank without channelling was assisted by such matters as the relative amounts of water that passed to the outer and inner sides of the annular collecting channel (N). These amounts were adjusted by drilling the requisite number of holes in the respective sides of the channel rather than allowing the water to " weir " over into the collecting channel. In addition a shallow " skirt " (O) was provided and this offset a tendency of the effluent to channel up the centre of the tank. The best depth of the skirt and its position were found by trial.

The clear effluent is passed to a mild steel tank (P) provided with a series of baffles to ensure rapid and thorough mixing, and an electrode system coupled to an electrical relay which actuates an air operated valve. This supplies sufficient hydrochloric acid to adjust the liquid to *p*H 8·2. The *p*H is recorded continuously on a chart. Although any one impounding tank load will be of constant alkalinity, very wide differences in alkalinity are encountered with successive tank loads, and either the strength of the acid or the travel of the control valve must be adjusted if excessive hunting is to be avoided. In practice a combination of these two methods is employed, the amount of acid required having been determined by titration of a sample.

The clear adjusted effluent is combined with the uncontaminated effluent at (Q) and passed to the bay. Samples of the treated and sedimented liquid are withdrawn during each pumping operation. These are tested for freedom from " heavy metals " and iron, suspended matter and any objectionable chemical known to be in process at the time—for example, chromate, which is treated with ferrous sulphate.

There is one area in the works remote from the treatment plant where small amounts of contaminated effluent arise. It was not found practicable to provide a suitable underground drainage system to the treatment plant from this area. Therefore a small impounding tank is provided in this area from which the effluent is pumped as required, the pump being actuated by a high and low level device. A stand-by pump is provided and in the event of failure of the first pump the second is automatically brought into operation and a visible and audible warning given. To avoid the necessity of providing a pipe and pumps, etc., of acid-resisting material the tank is provided with an electrode system with an electrical relay actuating an air-operated valve which supplies caustic soda solution as required in quantity sufficient to maintain the contents of the tank at a *p*H not less than 8·5. Caustic soda is used in preference to the cheaper lime to avoid the production of insoluble calcium salts which might tend to settle in the pump, pipes, valves, etc.

* * *

It is not claimed that there are any novel features in this plant, but it is emphasised that it would appear that every effluent disposal system has its own special problems and that some of the problems involved are best solved by empirical methods in the present state of knowledge. In the opinion of the writer it would be unwise to use data obtained from one plant in another plant subject to even slightly different conditions without first carrying out tests. Even when pilot-scale tests have been carried out caution is necessary when translating these results to a full-scale plant.

Product List. Albright and Wilson have issued a list of products of the general chemicals department, which has again been revised and brought up to date. The new list includes an insert which describes the scope of the service supplied by the department.

BOOK REVIEW

Waste Treatment

Edited by Peter C. G. Isaac, Pergamon Press, 1960. *Pp.* 450, 90*s. net.*

LAST September a symposium on the treatment of waste waters was held in the Department of Civil Engineering in the University of Durham. With commendable promptness the proceedings of this symposium have been published. There are 21 papers which between them cover current knowledge and recent advances in the treatment of wastes before discharge into rivers. They fall into two main fields:

1. The theory and practice of biological waste treatment.
2. The disposal of the solids removed from liquid wastes.

The book is thus a valuable reference work for chemists, chemical engineers and plant engineers.

Papers of particular interest to the chemical industry are: " The Treatment of Chemical Wastes," by I. S. Wilson; " The Treatment of Distillery and Antibiotics Wastes," by C. J. Jackson; " Process Design of Biological Oxidation Systems for Industrial Waste Treatment," by W. Eckenfelder and J. McCabe; and " Analytical Tests in Relation to the Discharge of Trade Effluents to Sewers," by S. H. Jenkins.

Increasing public attention is being given to the state of our rivers and the prevention of pollution and this book is a timely and useful treatment of an important subject. It is well illustrated and carefully edited.

Detergent Manufacture. Cyclo Chemicals Ltd. have produced two new technical bulletins entitled " Make your own synthetic detergent at half the cost with Cycloryl ABSA " and " Formulation of liquid detergents with Cycloryl ABSA." Cycloryl ABSA is dodecyl benzene sulphonic acid. The salts of this acid are the active ingredients of almost every nationally advertised detergent, both liquids and powders. The current trend, however, is for the detergent user to formulate and manufacture his own product, and now that the free dodecyl benzene sulphonic acid is available at such a high concentration, this has become a very simple and economical process. Raw material costs are considerably reduced and a greater freedom of formulation is permitted.

Treatment of Effluents from the Manufacture of Weedkillers and Pesticides

By A. E. Lambden,* B.SC., A.R.I.C., and D. H. Sharp,† PH.D., B.SC., F.R.I.C., A.INST.S.P.

By their very nature agricultural chemicals are inimical to some forms of life and in particular some are toxic to fish. A high standard of effluent treatment is necessary, therefore, in factories manufacturing weedkillers and pesticides. Here is a description of the effluent plant of Fisons Pest Control Ltd., near Cambridge. It is novel in that it employs active carbon to deal with bactericidal or bacteriostatic organic compounds.

THE rise of what is now known as the agricultural chemicals industry over the past 20 to 25 years has been spectacular. From very small beginnings before the war the acreage of crops sprayed in the free world increased to about 100 million acres in 1954[1] and since then this expansion has continued. There are now very many compounds of widely differing types available for use in crop protection. The main types of compounds currently used include:

(*a*) Weedkillers. These are of three main types:
  (i) plant hormones, principally chlorinated phenoxy aliphatic acids; typical compounds are M.C.P.A., M.C.P.B., 2:4 D, and 2:4:5 T.
  (ii) selective weedkillers based on substituted nitrated phenols (*e.g.* D.N.O.C., dinoseb); substituted carbamates; and T.C.A.
  (iii) general weedkillers, such as sodium chlorate, substituted triazines, and substituted ureas.

(*b*) Fungicides based on copper compounds, on organo-metallic compounds such as phenyl-mercury salts, and substituted thiocarbamates.

(*c*) Insecticides of two main types:
  (i) Contact insecticides based on chlorinated hydrocarbons such as D.D.T. and B.H.C., or on organic phosphorus compounds.
  (ii) Systemic insecticides based on organic phosphorus compounds.

(*d*) Soil fumigants based on ethylene dibromide and similar compounds.

This list is by no means complete and for a more complete list of commonly available products, their names and chemical composition, reference should be made to the appropriate British Standards publication.[2] (The common names for the compounds given above are as approved in this publication.)

These compounds are marketed in various mixtures and formulated as suspensions, emulsions, wettable powders, dusts, miscible oils, aerosols and solutions. Hence to the difficulties of treating effluents which arise directly from the manufacture of these active ingredients and from their by-products must be added the problems of treating the various solvents and formulants which are used.

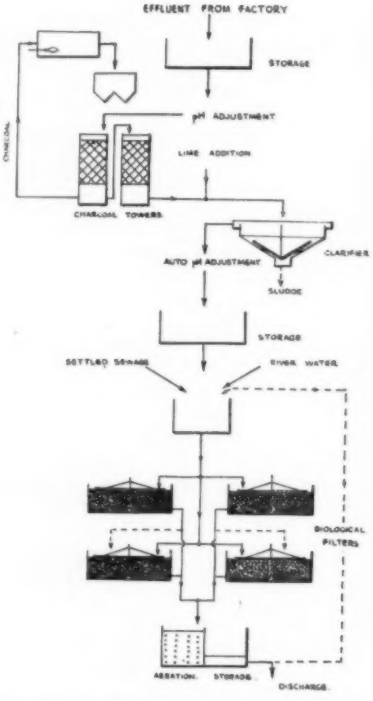


Fig. 1. Flow-sheet of effluent plant at Fisons Pest Control Ltd.

Although much progress has been made in recent years in the preparation and use of chemicals of low mammalian toxicity,[3] agricultural chemicals by their very nature are inimical to some form of life. In particular many of the compounds are toxic to fish and, when present in concentrations above certain limits, are bactericidal or bacteriostatic. These two factors render treatment essential before trade effluents arising from the manufacture of agricultural chemicals can be discharged to most watercourses and render very difficult direct biological treatment as commonly employed in the treatment of trade effluents.

Fisons Pest Control Ltd., effluent treatment plant

The factory of Fisons Pest Control Ltd. is situated almost on the banks of the river Cam, a few miles upstream from Cambridge. No discharge to a sewer is possible and a high standard of treatment is required by the River Board. The effluent treatment plant[4,5,6,7] is novel in that it employs active carbon to reduce the concentration of bactericidal or bacteriostatic organic compounds to levels at which they either could be directly discharged or destroyed in biological systems. Fortunately, organic compounds that are only feebly adsorbed from solution are of low molecular weight or hydrophilic in character and are readily destroyed biologically. Toxic metals are removed by lime treatment.

The treatment plant was therefore designed to incorporate three major steps:

(i) pre-treatment by active carbon to remove toxic organic chemicals, and
(ii) removal of toxic metals so that
(iii) biological treatment could re-

* Fisons Pest Control Ltd.
† Fisons Ltd.

Fig. 2. Aerial view of plant.

duce the oxygen demand of the effluent to a sufficient extent before its discharge to the river.

A flow sheet of the complete process is given in Fig. 1, and the layout of the plant is shown in the aerial photograph, Fig. 2.

Collection, neutralisation and adsorption treatment

The whole of the factory's liquid waste is made alkaline before discharge from the production plants and is collected in two underground storage tanks (15,000 gal. each), and then transferred by probe controlled pumps through cast iron pipes to pressed steel storage tanks (total capacity 240,000 gal.) on the treatment plant site. Sludge is allowed to settle out and as this is mainly inorganic in character (siliceous material, iron and calcium salts) it can be removed by tanker once a year and dumped.

Adsorption proceeds better in neutral rather than alkaline solution and so the effluent is neutralised before the adsorption treatment. The supernatant liquor from any selected storage tank is pumped to an agitated vessel and there the *p*H is adjusted to between 7 and 7·5 by the addition of concentrated sulphuric acid which is controlled by a commercial *p*H recorder-controller. The neutralised effluent is then filtered through sand to remove any suspended matter which would block the interstices between the carbon granules, and then pumped by float switch controlled pumps to the active carbon sorption towers.

There are six towers arranged in two banks of three, one bank being mild steel and the other of rubber-lined mild steel. A photograph of the towers is given in Fig. 3. Each tower is 25 ft. high and 7 ft. 6 in. in diameter. The sorption bed of 8 tons of carbon is supported 5 ft. from the base by perforated plates between which is sandwiched a gauze of Monel metal (30 B.S.S. mesh or 100 B.S.S. mesh). Two towers in each bank are used in series in order to obtain the optimum contact time, and the effluent is pumped to the top of each tower and allowed to percolate downwards through the bed of carbon, the tower always being kept full of liquid.

From the secondary towers the treated liquor gravitates to a common collecting vessel; and a valve on each of these lines adjusts the rate of flow through the whole system since all the pumps used are controlled by float switches. The third tower is emptied, re-filled and brought into use as a new secondary tower when the sorptive capacity of the carbon is exhausted.

Treatment to remove heavy metals and biological treatment

The effluent from the carbon towers is pumped to a vessel which is sited above a 30 ft. diameter Dorr-Oliver clarifier. A 1 in. branch is taken from this pipeline through a small steam ejector and the suction created is used to lift a slurry of hydrated lime into the receiving vessel and there to mix it with the effluent before it overflows to the central well of the clarifier. The dosage rate employed is between 1 and 3 lb. of lime per 1,000 gal. of liquor. Sludge is removed by hydrostatic pressure and disposed with that from settlement of the crude effluent. The clarified liquid overflows to a neutralising vessel where concentrated sulphuric acid is added by means of a commercial *p*H recorder-controller so as to reduce the *p*H to 7·5 before it is pumped to a pressed steel storage tank of 150,000 gal. capacity. Apart from removal of heavy metals (mainly copper) by co-precipitation, the lime treatment "softens" the effluent by the removal of salts that would otherwise give trouble on dilution with river water before biological treatment.

The effluent after treatment with active carbon is substantially free from toxic organic chemicals and is amenable to biological treatment. It is first diluted to about 30% with river water and mixed with settled domestic sewage (5,000 g.p.d.), which is pumped through a separate line from factory, before being distributed over the percolating filters by float-switch controlled pumps.

The biological filters are like those normally used in sewage treatment and they were originally designed as four units, each containing 200 cu. yds. of graded clinker medium to a depth of 6 ft. The pumping system enables a single pass or alternating double filtration to be used and provision is made for re-circulation of treated effluent. In 1958 two new filters, each containing 800 cu. yds. of clinker medium to a 6 ft. depth, were added and the pipework system rearranged so that these may be used in parallel with the previously existing filters (either by single pass or A.D.F.) or in series with them. The biologically treated effluent from the filter system is pumped to a concrete tank (100,000 gal.), where it is aerated continuously before overflowing into a settling tank from which the clarified final effluent is discharged to the river.

Fig. 3. The six active carbon adsorption towers. One bank is of mild stee and the other of rubber-lined steel.

Carbon handling and regeneration

Experience has shown that the use of the active carbon adsorption system is economically viable only if reactivation is carried out on site.

The towers are filled by making a slurry of carbon (1 ton to 1,000 gal. of water) which is pumped through flexible rubber lines into the top of the tower. They are emptied by backwashing to expand the bed and the resulting slurry is discharged, through a 3 in. valve, which is situated just above the supporting grid, into a drainage bunker. These are simple brick bunkers closed by removable wooden doors and equipped with a filter gauze of 30 mesh Monel so that the carrying liquid (in this case crude effluent) can be separated from the carbon. This drainage is pumped back to storage. The carbon is then removed in barrows to the reactivation furnace, which is a conventional oil-fired rotary kiln, the feed being co-current with the flame so as to burn the substances evolved and avoid a smell nuisance.

Wet, spent carbon is fed into the furnace using scoops attached to it and thus utilising the rotary motion of the kiln. Retention time is about 1 hr. and selection of the conditions inside the furnace controls the yield and activity of the product. Between 160 and 200 lb. per hr. (12 to 15 tons per week) of product at a yield of 90 to 95% and of similar activity to that originally used is obtained. A reactivation temperature of 600°C. to 650°C. (being the temperature of the gas stream above the carbon bed) is normally employed, and a neutral gas atmosphere is maintained in the furnace. Discharge is by a similar device to the feeding scoops. The hot carbon is immediately cooled below its burning temperature at present by means of a water spray discharging on to a vibrating tray. It is intended to replace this system by a dry heat exchanger in due course.

Such handling and reactivation invariably result in the breakdown of the particle size of the carbon and the fines thus formed are removed on a totally enclosed vibrating screen. The screen is fed from storage hoppers which are in turn filled by a mechanical conveyor which can discharge either to the slurrying vessels if towers are to be filled, or to the sieve if classification is needed.

The sorption system is designed for a flow rate of 3,000 g.p.h. using granular carbon of 10 to 22 B.S.S. mesh. When fines (passing a 30 B.S.S. mesh) reach more than 5 to 7% the flow rate through the bed is reduced and the fines are removed by screening. Since the flow rate depends on both the particle size and the diameter ratio, it has been found that the separated fines rescreened on 100 B.S.S. mesh could be used at a flow rate of between 1,500 and 2,000 g.p.h.

Performance of the plant

Daily samples are taken and analysed of the crude effluent, of the effluent after treatment with active carbon and of the final discharge. Records have been used to calculate average results over a recent year and these are given in Table 1, together with the volumes treated.

It is apparent that the plant is successfully treating the works' effluent. To achieve this, 320 tons of active carbon (used and regenerated) were required. A substantial reduction in the use of active carbon has been achieved over the usage in earlier years by examination of and modifications to the manufacturing processes.

Samples of the river water downstream from the discharge are analysed from time to time; no significant change in the quality of the river water has been observed and this is

Table 1.—Plant performance

	Crude effluent	*Effluent after treatment with active carbon*	*Final discharge*
Volume in million gall. p.a.	12·4	—	46
P.V.* p.p.m.	1,000	300	47
B.O.D. p.p.m.	500	260	23
Phenols p.p.m.	160	5	Less than 1
Glycollic acid p.p.m.	350	350	14
Total colour (as DNOC) p.p.m. ..	200	10	trace
DNOC p.p.m.	60	trace	trace

* Standard "permanganate value."

confirmed by the analyses made by the River Boards' Officers with whom there is close co-operation. Furthermore, the River Board arranged for a biological survey of the river to be made in 1955, that is one year after the plant came into operation, and the results were officially described as "reasonably reassuring."

The value of active carbon adsorption treatment as a pre-treatment designed to reduce the concentration of toxic organic chemicals in a trade waste so that the residues may be treated by percolating filters has been demonstrated by the operation of a full-scale commercial plant for the past five and a half years. The versatile sorption characteristics of carbon are especially valuable in the agricultural chemical industry, in which products and manufacturing methods change quickly and where little is known of the problems of treating new compounds. It is also of value in protecting biological treatment systems from shock loads. Treatment costs are high, providing an incentive to reduce the load on the effluent plant by careful attention to the manufacturing processes.

Acknowledgements

The authors wish to express their indebtedness to many colleagues, notably Dr. G. S. Hartley and Mr. J. W. Warburg; and to Mr. E. M. Tundak and Mr. C. O. M. Woodside for their collaboration in the laboratory and plant; to Mr. K. M. Roddis, Clerk to the Great Ouse River Board, and to the Pollution Officer, Dr. H. Clay, for their advice and co-operation; and finally to the Board of Directors of Fisons Pest Control Ltd. for permission to publish this paper.

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OIL SOLUBILISING PROCESS

A novel process for solubilising mineral, vegetable and animal oils in low molecular weight alcohols by the use of esters of fatty acids is covered in U.S. Pat. 2,865,859, awarded to Irwin I. Lubowe, a New York City physician and chemist.

The patent discloses the use of isopropyl, ethyl, methyl and butyl esters of fatty acids, saturated and unsaturated.

Mineral, peanut, sesame, cottonseed, corn, avocado, olive, soya bean, safflower, peach kernel and palm kernel, codliver, shark, mink and lanolin oils can now be solubilised in ethyl, methyl, isopropyl alcohol and other low molecular weight alcohols. The fatty acid esters most frequently used are isopropyl palmitate, methyl myristate and linoleate, ethyl palmitate and ethyl myristate.

It is suggested that with this new process, improved anti-dandruff hair lotions, hair lacquers, anti-perspirants, shaving lotions, astringent preparations, face lotions, fungicidal and bactericidal solutions can now be used with better therapeutic effect.

The patent also suggests the use of this process for post-operative and geriatric feeding containing large amounts of nutritive vegetable oils and ethanol.

The fortification with fatty acid esters of cutting and lubricating oils to prevent rancidity and to add longer life to these oils is also proposed.

British Pat. 803,545 has been granted and patent applications are pending in other countries.

The fatty acid esters used in the invention are non-toxic, emollient and skin penetrating.

LIQUID DETERGENT

A heavy-duty, opaque, mucilaginous, liquid detergent which does not separate on standing and remains stable within the range 40°-80°F. contains (*a*) 10-22% of sodium dodecylbenzene sulphonate, (*b*) 15-22% of potassium pyrophosphate, (*c*) 2-5% of coconut oil fatty acid monoethanolamide, (*d*) 3-5% of ethyl alcohol, (*e*) 3-5% of glycerol. Components (*d*) and (*e*) determine the mucilaginous nature of the fluid; the ratio of $d : e$ is critical if the liquid is to be stable. Preferably all the ingredients except (*d*) are mixed (at 70°F.) and the necessary amount of (*d*) is added. (Brit. Pat. 815,850.)

CHECKING STP IN DETERGENTS

A faster, more precise means for determining directly the sodium tripolyphosphate content and associated impurities in synthetic detergents has been worked out in the U.S.A., using an ion-exchange chromatographic method with a difference. This should be welcomed by the synthetic detergent industry in which the exact composition of commercial STP has become increasingly important in the last few years, and which has hitherto lacked a speedy, accurate method of analysis.

In work carried out in the laboratories of Monsanto Chemical Co. it was found that a major cause of poor precision in ion-exchange analyses is the erratic and incomplete recovery of the phosphate species from the column. This problem has been solved by reversing the flow of the eluant through the column and using an extremely fine-mesh, tightly packed resin bed. The pressurised, reverse-flow pattern works to prevent channelling and eliminates eluant convection currents in the resin bed.

A quantitative determination of the eluted phosphate species is made by an improved molybdenum blue colorimetric method. Only one fraction is collected and analysed for each species.

The complete composition of commercial STP is obtained and the procedure is claimed to be about twice as fast (1·33 man hours/sample) as paper chromatography. Four to six complete analyses can be made in 8 hr. when using four to six columns.

The method can also be used to analyse completely any mixture of low-molecular-weight phosphates including *ortho*, *pyro*, tripoly, tetra-*meta* and tri*meta*. Further details were given by R. H. Kolloff in *A.S.T.M. Bulletin*, 1959, No. 237, 74.

SCOURING CLEANSER

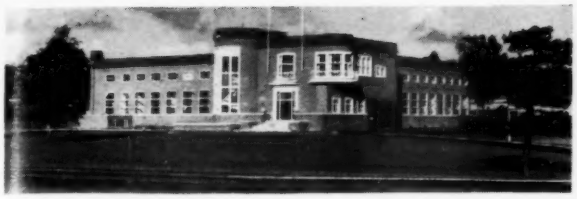
A paste scouring cleanser claimed to be superior to a soap or soap-based cleanser comprises 50-73% of silex, 2-10% of a C_8-C_{18} alkyl benzene sulphonate, 4-10% of sodium tripolyphosphate, 0·6-2·5% of a high titre soap having a titre of 25°-60°C., 1-3% of glycerine and 15-30% of water. A high titre soap is selected as a gelling agent as it shows a satisfactory change in viscosity with change in temperature at the chosen concentration. (U.S. Pat. 2,892,795.)

A New Surge of Expansion in the British Pharmaceutical Industry

"Manufacturing Chemist's" 1960 Survey Reveals Expenditure of £12 Million

Our survey of expansion by British pharmaceutical companies within the United Kingdom published last May disclosed an expenditure of £8·6 million on new factories, laboratories, plant and equipment. Our latest survey reveals an even bigger surge of expansion. Thirty-one firms, compared with 21 last year, have sent us information and their recent and projected expenditure totals £12,041,000—an increase of over £3·4 million. Nineteen firms included in this year's survey did not feature in last year's, so between them the two surveys account for 42 companies. This year's total includes figures submitted for inclusion in the total only. One company did not disclose costs, so the total is higher than £12,041,000. Once again information is given under four heads: 1. Details of new buildings and/or extensions to existing buildings with date of completion; 2. Purpose of new facilities; 3. Costs with, if possible, distinction between buildings and plant and equipment; and 4. Main contractors and suppliers. We are grateful to the companies concerned for co-operating in our survey.

Firm	Projects	Purpose of new facilities	Costs	Main contractors and suppliers
ABBOTT LABORATORIES LTD., Queenborough, Kent.	New chemical, pharmaceutical and administration buildings. End of 1961.	Replacement and extension of factory at Jarrow.	£1,500,000	C.A.S. (Industrial Developments) Ltd.
ARMOUR PHARMACEUTICAL CO., LTD., Eastbourne.	New buildings and extensions	Manufacturing pharmaceuticals. Output valued at approximately £100,000 p.a.	Building, £40,000 Plant and equipment, £135,000	—
BEECHAM RESEARCH LABORATORIES LTD., Brockhurst Park, Surrey.	Extension to research buildings.	Pharmaceutical and pharmacological research.	—	Contractor: Percy Bilton Ltd. Suppliers of plant almost entirely British.
Worthing, Sussex.	New factory due to come into operation in July.	Manufacture of fine chemicals, antibiotics, pharmaceuticals.	—	—
THE BRITISH DRUG HOUSES LTD., B.D.H. Laboratory Chemicals Division, Poole, Dorset.	Continuation of development of an 18-acre site at Broom Road, Poole.	Warehousing, packing and despatch of laboratory chemicals and fine chemicals.	£600,000, spread over 2 to 3 years.	—
CIBA LABORATORIES LTD., Horsham. New project at Pyewipe, Grimsby.	Three-year development scheme includes: new office block, new production building and new plant, new engineering workshop, expansion of existing research and development facilities and a new drying, grinding and blending plant. The scheme was started in 1958. The bulk of the building programme is now complete.	The new plant will manufacture sulphonamides and other fine chemicals.	£520,000.	Main contractors: Richard Costain Ltd. Architectural Consultants: Messrs. J. Douglass Mathews and Partners.



THE EXPANDING PHARMACEUTICAL INDUSTRY

Top left: The new building of Ortho Pharmaceutical Ltd., at Saunderton, Buckinghamshire. Bottom left: The recently completed pharmacological research department at the Hounslow, Middlesex, laboratories of Parke, Davis and Co. Right: May and Baker's research institute at Dagenham, Essex, with the completed biological wing in the foreground and the chemical wing (behind) nearing completion.

Firm	Projects	Purpose of new facilities	Costs	Main contractors and suppliers
ARTHUR H. COX AND CO. LTD., 93 Lewes Road, Brighton 7.	Addition of a second floor to existing premises.	To improve flow and to house packaging components now warehoused away from present site.	Buildings, £10,000. Plant and equipment, £10,000.	V. and L. Cruttenden Ltd., Brighton. John Boon Ltd., Brighton. Heating and Ventilation (Southern) Ltd., Brighton.
CYANAMID OF GREAT BRITAIN LTD., Gosport, Hants.	Antibiotic fermentation facilities. Completion due end 1960.	Manufacture of Ledermycin HCl, and also for production of aureomycin feed supplement.	Buildings, £277,000. Plant and equipment, £873,000.	Lummus Co. Ltd.
	Melamine production facilities. Completion due end 1960.	Manufacture of melamine resin.	Buildings, £38,000. Plant and equipment, £187,500.	—
	Warehouse extension. Completion due March 1961.	Warehousing of pharmaceutical raw materials.	Buildings, £103,000. Equipment, £8,000.	—
DALMAS LTD., Leicester.	Under active consideration: New factory to replace existing four factories and provide additional 20,000 sq. ft.	Manufacture of medical and surgical plasters. Research on adhesives and new products.	—	Local builders. Plant and equipment from English, German and Swedish suppliers.
	Under active consideration: Additional new factory.	As above.	Factory, £200,000 to £500,000. Plant, £100,000 to £200,000.	As above.
THE DISTILLERS CO. (Biochemicals) LTD., Speke, Liverpool.	New, three-storey production building. General extension to tableting storage and staff amenities. Overall completion—July, 1960.	Modernisation and expansion of productive capacity.	Buildings and air conditioning, £170,000. Plant and services, £280,000.	Distillers Co. Ltd., Engineering Division. General Building Contractor: Sir Alfred McAlpine and Son Ltd.
EVANS MEDICAL LTD., Speke, Liverpool.	Virus division comprising tissue culture department, egg culture department and virus research laboratories. Due for completion this year.	Production of and research into virus vaccines and diseases.	—	William Neill and Son (St. Helens) Ltd.
GLAXO LABORATORIES LTD., Greenford, Middlesex.	New administrative and drawing offices block at Montrose factory. Opened in May 1959.	—	—	R. Pert and Sons Ltd.
Sefton Park, Stoke Poges, Bucks.	New laboratory block. Completed December 1959.	Poliomyelitis research and production.	—	W. Hartley and Sons Ltd.
Ulverston, Lancs.	New analytical block under construction.	Improved facilities for analytical control of antibiotics.	—	Taylor Woodrow Group.

EXPANSION IN THE BRITISH PHARMACEUTICAL INDUSTRY

Firm	Projects	Purpose of new facilities	Costs	Main contractors and suppliers
HOWARDS OF ILFORD LTD., Ilford.	New aspirin making plant.	Rebuilding and enlarging aspirin production facilities of Stage 2. Stage 1 was completed last year.	—	—
	New sorbitol plant.	Major expansion of sorbitol manufacturing capacity.	—	—
	New research laboratory block.	To house existing and increased research staff.	£30,000.	Hammond and Miles.
HUFFER AND SMITH LTD. (Fine Chemical Division of C. F. Gerhardt Ltd.) Croydon.	Laboratory and office extension.	Manufacture of new synthetic fine chemicals.	—	—
JOHN KNOX (S-o-T) LTD., Jaynox Works, King's Street, Longton, Stoke-on-Trent, Staffs.	Additional storage and office accommodation. Extension of present premises.	Faster and more efficient handling of pharmaceutical products distribution.	Buildings, £26,000 approx. Plant and fittings, £2,500 approx.	—
ELI LILLY AND CO. LTD., Basingstoke, Hants.	Extension of existing premises. Due for completion June 1960.	New administrative block, extension of warehouse space, additional staff welfare rooms. The space released in the present buildings will be used for an extension of laboratory facilities and manufacturing products, including a new sterile products department.	Buildings, £200,000. New equipment, £50,000.	Jones of Maidenhead. R. E. Eagan, London, S.W.1.
MAY AND BAKER LTD., Dagenham, Essex.	Construction of a new research institute. Buildings to be equipped and fully operational by early autumn 1960. The institute will comprise three main buildings: a chemical wing; central building housing library, lecture theatre and administrative offices; and a biological wing. The entire block will provide over 100,000 sq. ft. of floor space.	To unite existing research groups from various laboratories and provide additional facilities for scientists working on expanded research programmes. Liaison with the present Agricultural and Veterinary Research station at Ongar will be continued and further development of this field research station will take place.	Building, £1,000,000.	W. and C. French Ltd.
MIDDLETON AND CO., LTD., Middlesbrough.	New building, completion June 1960.	Offices. Scientific apparatus. Analytical chemicals. Heavy chemicals.	Building, £20,000. Equipment, £5,000.	Chas. Tennet Ltd., Stockton-on-Tees.
MILES LABORATORIES LTD., Piccadilly, London, W.1.	Restoration of an old historical country mansion—Stoke Court, Stoke Poges, Bucks. Expected to be ready by end September 1960.	For use as research laboratories, and administrative and sales headquarters for all facets of the company's business. Production division will continue at Bridgend Industrial Estate, Glamorganshire, S. Wales.	Approx. £200,000.	Restoration and conversion of building: Wm. Hartley and Sons (Wexham) Ltd. Laboratories: Scientific Installations Ltd.
THOMAS MORSON AND SON, Ponders End, Enfield, Middlesex.	*Completed:* Canteen Oct. 1959. Control laboratory Nov. 1959. Solvent recovery unit Feb. 1960. Bulk storage Feb. 1960. Technical offices April 1960.	Continuation of expansion programme started in 1958.	Buildings, £20,000. Equipment, £45,000.	C. Hunt and Son Ltd. (Builders). Jennings Bros. (Pipework). Sigmund Pumps (Pumps). Elliott Bros. (Instruments). Jennings Bros. (Laboratory furniture and fittings).
NEWTON CHAMBERS AND CO. LTD., Thorncliffe, Sheffield.	New chemical works and central laboratory block. Building will commence in April. The main production building will be completed at the end of 1960. Completion of whole programme by end of 1961.	New chemical works will produce disinfectants. detergents, washing creams, insecticides, barrier creams, cutting oils, etc.	£300,000.	—

Firm	Projects	Purpose of new facilities	Costs	Main contractors and suppliers
ORGANON LABORATORIES LTD., Newhouse by Motherwell, Lanarkshire, Scotland.	Extension of solvent recovery dept. Due for completion March 1960.	Increase of range of solvents recovered with resulting cost reductions.	Plant and equipment, £15,000.	Geo. Scott and Sons Ltd., Leven.
	General extension and improvement of production plant facilities during 1960.	General production increase of steroids, etc., and related activities.	Plant and equipment, £20,000.	—
ORTHO PHARMACEUTICAL LTD., Saunderton, Bucks.	New building, occupied May 1959.	Extended facilities for laboratories, manufacturing, shipping and administration; to house growth of domestic and export trade in ethical pharmaceuticals (obstetrical, gynæcological and allied fields).	Building, £250,000. Plant and equipment, £60,000.	Thos. Lowe and Sons Ltd., builders.
PARKE, DAVIS AND CO., Hounslow, Middx.	A building of 14,750 sq. ft. Fully air-conditioned. Air-conditioning for capsule manufacture and filling and binding separately controlled to give conditions suitable for all processes.	Manufacture of hard gelatin capsules.	—	Truett and Steel of Thornton Heath.
	New building for pilot plant processes. Under construction mid-1960.	For product development.	—	—
	Storage buildings being completed at the time of the 1959 survey are now in use.			
PFIZER LTD., Sandwich, Kent.	Extension to vaccine manufacturing facilities. Completed March 1960.	Extension of vaccine research and production.	Buildings, £72,000. Plant and equipment, £92,140.	Buildings: Jenners. Pipework: Hadens. Electrical: Blighs.
	Office block.	To house administrative and sales personnel.	Building, £500,000.	Piling: Soil Mechanics Ltd.
SANDOZ PRODUCTS LTD., Horsforth, Nr. Leeds.	New building opened April 1959. Replaces premises at Stonebridge Park, London, N.W.10.	Manufacture and packaging of medical specialities. Factory includes laboratories and storage accommodation.	—	Principal Contractors: Irwins of Leeds.
SMITH KLINE AND FRENCH LABORATORIES LTD., Welwyn Garden City.	1960—completion of new laboratories, factory and offices.	—	Buildings, £910,000. Equipment, £100,000.	William Sindall Ltd.
	1960-62—phased expansion of premises. Laboratories, office and factory total 100,000 sq. ft.	—	Estimated cost, £600,000.	—
Tonbridge, Kent.	1960—extension to chemical plant.	—	Buildings, £41,000. Plant, £21,000.	G. E. Wallis and Sons.
E. R. SQUIBB AND SONS LTD., Speke, Liverpool.	New research and development laboratory to be constructed during 1960.	—	£20,000.	—
THOMPSON AND CAPPER LTD., Speke Hall Road, Liverpool 24.	New office building. Extension to factory.	Expansion of production.	Buildings: £30,000. Plant and equipment, £5,000.	—
VITAMINS LTD., Walton Oaks Research and Experimental Station	General purpose laboratories.	—	£45,000.	—
Crawley, Sussex.	Additions to factory.	—	£160,000.	—
WARD BLENKINSOP AND CO. LTD., Halebank, Widnes.	Control and development laboratories—part of 1-2 year development plan.	Fine chemical manufacture.	£30,000.	—
JOHN WYETH AND BROTHER LTD., Havant, Hants.	Chemical process development department. Completed March 1960.	Development of manufacturing processes for miscellaneous fine chemicals.	£60,000.	Main Contractor and Architects: The Chamberlain Group, London. Basic design by own staff.

New Polysaccharide Gums Produced by Microbial Synthesis

Two new gums—Phosphomannan Y-2448 and Polysaccharide B1459—produced by fermentation have been developed by the Northern Regional Research Laboratory of the U.S. Department of Agriculture. They are obtained from cheap and readily available raw materials and have a wide range of potential uses including pharmaceuticals, cosmetics, polishes and adhesives.

Production

Phosphomannan polysaccharide is produced extracellularly by a newly discovered yeast species, *Hansenula holstii* NRRL Y-2448. Polysaccharide B-1459 is a product of *Xanthomonas campestris* NRRL B-1459, a bacterium which is a minor plant pathogen. Both organisms can be readily maintained and propagated on common microbiological media. Corn sugar, in concentrations of 2 to 6%, is used as the carbohydrate raw material for polymer production. Common organic nitrogen sources, such as corn steep liquor or distillers' solubles, used at relatively low levels support adequate growth of the micro-organisms. Potassium phosphate is used in the fermentation medium to furnish phosphate required for growth of the organisms and to help maintain the *p*H in the range desirable for polymer synthesis. Phosphomannan Y-2448, which contains phosphate groups, is produced best at *p*H values of about 5, whereas the optimum *p*H for Polysaccharide B-1459 production is near 7. Appropriate trace elements are included in the media; the amount and kind used depend upon the ash content of other medium ingredients.

Fermentation processes to produce both microbial gums have been developed, using equipment that includes laboratory shaker flasks and small-scale fermentors. For all fermentations 5%, by volume, of inoculum was found to be sufficient. The procedures used are typical of pure culture, submerged, aerobic processes, and both organisms grow satisfactorily at 25° to 30°C. Aeration requirements are moderate, although the increase in viscosity of the broth during fermentation greatly impedes oxygen transfer. Normal fermentation cycle is about 96 hr. during which time the glucose concentration decreases concomitant with an increase in viscosity of the culture liquor. At the end of the incubation period very little corn sugar remains unfermented. The fermented Phosphomannan Y-2448 broth has a viscosity of about 600 cps. and the B-1459, about 15,000 cps. Yields of polysaccharide, calculated on the basis of corn sugar in the medium range from about 40% with Y-2448 to 55% with B-1459.

Cells of the micro organisms are removed from culture liquors by centrifugation. In experimental studies both polymers were precipitated from centrifuged broths by addition of methanol and an electrolyte, such as potassium chloride. It is expected that more economical precipitation procedures will also be suitable. This step of the recovery process can be repeated several times; that is, the crude precipitate may be dissolved in water and re-precipitated with methanol, depending upon the purity of product desired. Final dehydration of the Y-2448 phosphomannan is accomplished by addition of polymer solution to absolute methanol. The B-1459 polymer is dehydrated and is partially decolorised by suspending the fibrous product in methanol. The resulting precipitates are recovered by filtration or centrifugation, and residual methanol is removed by vacuum drying.

Yields of product are essentially the same as those realised at the end of the fermentation process. Research on more economical recovery and on purification procedures is in progress.

Production and Composition of Microbial Polysaccharides

Carbohydrate substrate	Causative Microorganism		Polysaccharide Components	
	Name	NRRL strain	Name	Proportion
	Dextran			
Cane or beet sugar	*Leuconostoc mesenteroides*	B-512	Glucose	
	Phosphomannan			
Corn sugar	*Hansenula holstii*	Y-2448	Mannose	10
			Pyrophosphate	1
			Potassium	2
	Polysaccharide B-1459			
Corn sugar	*Xanthomonas campestris*	B-1459	Mannose	2
			Glucose	1
			Potassium Glucuronate	1
			Acetyl	1

Table 1

Properties

The composition and properties of the two new microbial polysaccharides of widely different origin are compared with dextran in Table 1. Each of the polysaccharides has a molecular weight of the order of millions; all dissolve readily in water to form solutions having *p*H in the neutral range. Dextran is a neutral polysaccharide; the other two are acidic polysaccharides which, for convenience in experimental work, are isolated as potassium salts. The absence of an ionic group or the amount and strength of the acid group present has marked effects on viscosity and other physical properties of these hydrocolloids.

Dextran from *Leuconostoc mesenteroides* NRRL B-512 differs from most known dextrans in its ease of

solubility in water and in having a high percentage (95%) of its anhydroglucose units linked only through C_1 and/or C_6 positions. This structure confers upon it a low degree of branching and an advantageous stability to hydrolytic scission. Dextran from this strain is used internationally as a source of a synthetic blood-volume expander and other pharmaceutical products.

Phosphomannan Y-2448 is unlike any other substance hitherto available in composition and therefore in certain properties. The cohesive, stringy gum obtained upon precipitation with alcohol is pictured in Fig. 2. The gum forms brilliantly clear, thixotropic solutions with a soft gel-like aspect. Uniquely, the viscosity at both 1·5 and 5·25% concentrations is 2,500 cps., Brookfield, 30 r.p.m., 25°C., a value greater than when the concentration is 3%. Behaviour of this gum is typical of a polyelectrolyte in the sensitivity of its viscosity to salt (Fig. 3). Formation of clear, ropy gels of extremely high viscosity when complexed with borax is typical of mannose polymers (Fig. 2 and 3). Solutions of Phosphomannan Y-2448 are exceptionally resistant to microbial attack; the solid has good storage stability.

The viscosity-concentration curve for Polysaccharide B-1459 is comparable to those for gums tragacanth and guar, and for high-viscosity sodium alginate. Solutions of the B-1459 gum show weak, soft gelation and the rheological properties of plastic fluids. At concentrations greater than 0·25% it shows the anomalous property of increased viscosity in the presence of salts (Fig. 3). The stability of viscosity to heat, especially in the presence of salt, differentiates this polysaccharide from most hydrocolloids now in use. Solutions dry to good films which have some unusual aspects. The solid has excellent stability in storage.

Fig. 1. A part of the ARS Culture Collection of industrially and agriculturally important micro-organisms. Thousands of lyophilised cultures in sealed glass ampoules are maintained under refrigeration.

Potential applications

The microbial polysaccharides described are produced from low-cost and readily available raw materials. Therefore, the raw materials supply should be stable, be easily increased or decreased, and require a minimum of inventory. Unfavourable seasons, labour problems and international conditions are not a factor as in most high-grade natural gums. Uniform quality should be possible at all times or the quality could be varied as desired. These considerations are a major, forward step in the industrial gum industry.

It is expected that these gums should be relatively non-toxic and suitable for most food uses. This opinion is based on the raw materials and processing required and on the chemical nature of the final products, rather than actual test results. Toxicity tests have not been run.

Industrial uses for gums such as these must, at this early stage of development, be speculative only. The

THE NORTHERN REGIONAL RESEARCH LABORATORY

In 1938 the United States Congress authorised the establishment of four regional research laboratories, one in each major agricultural producing area, to conduct basic and applied research designed to expand, improve and develop new scientific, chemical and technical uses and new and extended markets for American farm crops, their products and by-products.

The four laboratories are now divisions of the Agricultural Research Service. The Northern Laboratory is located at Peoria, Illinois, and has a full-time staff of approximately 400, of whom about 200 can be classified as professional research workers. The Laboratory conducts chemical, chemical engineering and other scientific research to locate and develop new uses for cereal grains, such as corn and wheat, and for oilseeds, such as soya beans and flaxseed; and to discover new industrial crops. The work is approximately 40% basic research and 60% applied research. However, this ratio can vary, depending upon the urgency of current projects.

The research of the Northern Laboratory is organised into five major areas: Cereal crops, industrial crops, fermentation, oilseed crops and engineering and development. An important part of fermentation research is the ARS Culture Collection, which maintains and utilises one of the most complete collections of commercially valuable moulds, yeasts and bacteria (Fig. 1).

Fermentation research has contributed many of the more important developments of the Laboratory since it was initially opened in 1940, *e.g.*:

1. Organisms and processes for fermentative production of:

   Vitamins B_2 and B_{12}
   Penicillin
   Gibberellin—a new plant-growth hormone
   Dextran—a blood plasma extender

2. Processes for saccharic, gluconic and 2-ketogluconic acids
3. Fungal amylase process to make industrial alcohol

Microbial conversion represents an important approach to modifying agricultural raw materials through microbiological agents. An appreciation of the potential value and the wide variety of microbial polysaccharides available through carbohydrate fermentations was gained during the studies conducted on dextran some years ago. Many different gums are possible by the use of different yeasts, moulds and bacteria.

The production of polysaccharide gums by microbial synthesis is an important fermentation development. Phosphomannan Y-2448 and Polysaccharide B-1459 are two new products developed at the Northern Laboratory.

Fig. 2. Microbial fermentations of corn sugar give new polysaccharide gums, such as Phosphomannan Y-2448. Left, the new polysaccharide gum is long, cohesive and semi-firm; right, addition of borax increases solution viscosity and produces a ropy solution.

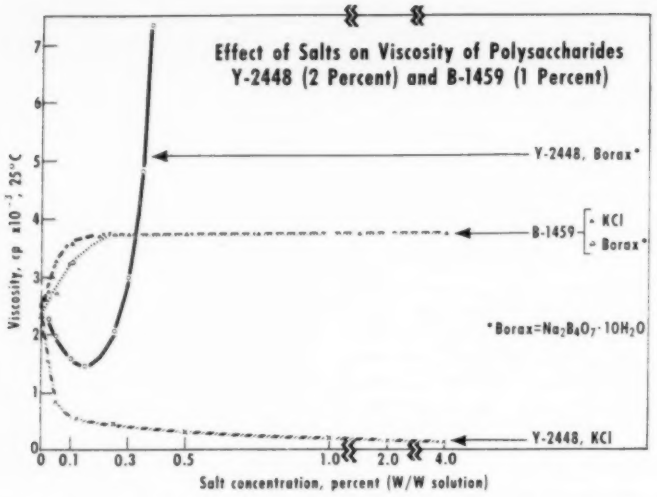


Fig. 3. Behaviour of the new gum is typical of a polyelectrolyte in the sensitivity of its viscosity to salt.

gums combine certain unusual characteristics and properties not available in other commercial gums. However, there is no proof that the properties are so specific that competition with other gums will not be a factor. Typical applications for which the new polysaccharides have been considered of potential value are:

Pharmaceuticals

For producing and stabilising creams and emulsions.

For formulating toothpastes, syrups and emollients.

Foods and Beverages

For preparing salad dressings and sauces.

For improving the character and quality of beverages.

Cosmetics

For stabilising the emulsion in hand creams and lotions, imparting spreading properties and increasing the viscosity.

Chemical Processes

For stabilising polymerisation systems.

Petroleum

For use in oil-well drilling muds.

Polishes

For use in car, furniture and floor polishes.

Textiles

For use in finishing fabrics such as rayon by giving body to the fabric without interfering with the transparency.

Adhesives

For use as a simple adhesive in paper products or as an adhesive for envelopes and labels.

At the present stage of development, production costs are not available. Research is in progress to improve several of the operations employed in the laboratory-scale process. The outlook is favourable for the development of economical processes more suitable for industrial production. It is expected that initially the gums would sell at about the same figure as the higher priced gums. However, their efficiency could well make them competitive with much lower cost gums on an equivalent performance basis.

FAST ACTING ANÆSTHETIC

Heinrich Gruber of Berlin has been granted U.S. Pat. 2,839,447 for an ultra-fast acting, short-term liquid anæsthetic for intravenous injection based on a derivative of barbituric acid. By the addition of a suitable quantity of glycerine, the stupor usually induced by a barbituric drug is overcome and a patient is in full command of his faculties immediately on awakening and is "fit" after only 30 min. The presence of diethylether in the anæsthetic formulation stimulates breathing and metabolism, thus expediting the decomposition of the drug in the body. The anæsthetic is recommended for localised operations requiring a short period of time.

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ANTIBIOTICS

By I. L. S. Mitchell,* B.Sc., Ph.D.

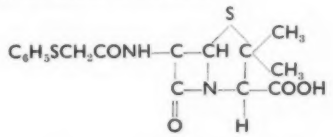
Phenylmercaptomethylpenicillin ● Wide spectrum antibiotic ● Streptomycin toxicity ● Polypeptide antibiotics ● The macrolides

A new penicillin

THE familiar penicillin of commerce —benzylpenicillin (penicillin G)— is one of a family of related compounds all containing the same nucleus, a substituted fused lactam-thiazole ring system, but differing in the side-chains.

Some of these penicillins were described briefly in the February progress report.

A further series of new penicillins has been the subject of a recently published patent.[1] These penicillins contain the usual penicillin nucleus, but differ from those previously known in that their side-chains are derived from S-substituted mercapto-acetic acid. One of these—phenylmercaptomethylpenicillin—is analogous to the well-known phenoxymethylpenicillin, penicillin V, but with the side-chain oxygen replaced by an atom of sulphur.



Phenylmercaptomethylpenicillin

Various modifications of this penicillin, such as the *p*-bromo- and *p* - hydroxymercapto - methylpenicillins, are included. Penicillins of this type have been reported previously,[2] when their biosynthesis was stated to have been achieved by including in the fermentation medium the S-substituted mercapto-acetic acid as precursor.

It has now been discovered that these penicillins, in the form of the free acids, are stable and only slightly soluble in water. It is suggested in the patent specification that these penicillin acids will be suitable for use as "depot" or "repository" penicillins for oral or intramuscular administration. The use of relatively insoluble forms of penicillin G as depot salts is well known, the advantage of such compounds being that prolonged blood levels can be obtained from a single dose. The free acid of benzylpenicillin is unstable and therefore not available for pharmaceutical preparations, but there are some amine salts, such as the procaine and NN′-dibenzylethylene diamine salts, that are relatively insoluble in the body fluids and are therefore suitable for use as depot salts.

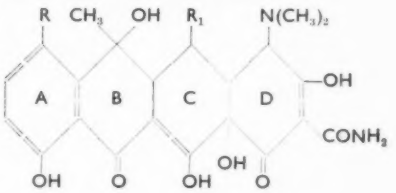
The free acid of penicillin V is stable and comparatively insoluble in water and has shown a depot effect after oral and intramuscular administration.[3] It is not clear what advantage the mercaptopenicillins have over penicillin V, and their commercial exploitation must depend on how they compare with penicillin V in terms of cost of production, toxicity, stability and clinical effect.

Demethylchlortetracycline

A further advance in the field of "wide spectrum" antibiotics is indicated by reports on clinical trials of demethylchlortetracycline, presented at the Seventh Annual Antibiotics Symposium held in Washington during November 1959.

The first wide spectrum antibiotic of the tetracycline group to be marketed was chlortetracycline (Aureomycin), originally obtained crystalline by extraction from fermentation broth cultured with *Streptomycin aureifaciens* in 1947 and tested on human patients in 1948. This compound provided a great advance in chemotherapy when it was found to be effective against the organisms causing typhoid fever, the rickettsias and viruses, a group against which streptomycin and penicillin had been found ineffective.

Another member of the tetracycline group soon followed, in 1950 oxytetracycline (Terramycin) was marketed, the organism by which it was produced, *Streptomyces rimosa*, having been discovered only in 1949. It was quickly recognised that the antimicrobial spectra of these two antibiotics were similar, and that they differed only slightly in their chemical structure.



Chlortetracycline R = Cl R^1 = H
Oxytetracycline R = H R^1 = OH
Tetracycline R = H R^1 = H

For a time chlortetracycline and oxytetracycline found wide application, but during 1953 and 1954 their use diminished because of many reports about distressing side effects after their administration and the gradual appearance of strains of some micro-organisms resistant to them.

In 1953 the structure of yet another member of the group—tetracycline—was elucidated and found to be chemically similar to those of the two already discovered. Tetracycline was found also to have a similar therapeutic effect and has since almost replaced its analogues in medical use because of its comparatively rapid absorption from the gastro-intestinal tract and ease of penetration into the cerebro-spinal fluid.

Several analogues of tetracycline have since been produced, but of these only demethylchlortetracycline appears to have any appreciable clinical value. The new antibiotic is produced by a mutant of the organism used in the manufacture of chlortetracycline and differs from the latter by the absence of the methyl group of ring B; this results in an

* Glaxo Laboratories Ltd.

enhanced stability to acid and alkali in comparison with the other members of the series.[4,5,6]

Clinical tests have shown demethylchlortetracycline to be active against more strains of bacteria than the other tetracyclines, particularly in infections of the urinary tract. Higher blood levels are obtained than with other analogues for smaller doses; a low rate of excretion (half as fast as that of tetracycline) results in blood levels being maintained for longer periods. Against several species of bacteria demethylchlortetracycline has been found to be twice as active as tetracycline.

This antibiotic, which represents the first clear improvement on tetracycline, is now being marketed in the U.S.A.

Toxicity of the streptomycins

Like most of the antibiotics in the wide range currently available to the medical profession, the streptomycins sometimes exhibit toxic side effects when administered to patients, particularly those with severe infections for which large and frequent doses are required. The streptomycins affect some functions of the eighth cranial nerve. An impairment of the cochlear function, often described as ototoxicity, of which a symptom is deafness, can result from the administration of dihydrostreptomycin, whereas streptomycin can have a toxic effect on the vestibular function, thereby causing dizziness and lack of balance.[7]

Many attempts have been made to lessen these toxic effects. Addition of various amino acids and vitamins, particularly of pantothenic acid, has been claimed to reduce toxicity, but the published results, both of laboratory and clinical trials, have been conflicting. Favourable results by one group of workers have not been reproduced by others.

A great difficulty has been the absence of satisfactory laboratory tests for deafness and dizziness. Some workers have trained rats and mice to climb rope when a bell or buzzer is sounded and have used the intensity of sound that evokes a response as a measure of deafness. Dizziness or lack of balance has been tested by observing the ability of cats to land firmly from a jump.[8,9]

The problem was discussed at the Seventh Annual Symposium on Antibiotics.

Because of the number of cases of deafness resulting from the use of dihydrostreptomycin, the U.S. Federal Drug Authority decided to restrict its use from January 13, 1960. It may no longer be sold in combination with other drugs for parenteral use in human beings, and when it is used alone the label must carry a clear warning. There has consequently been a marked change to streptomycin in the States, where formerly dihydrostreptomycin was used almost exclusively.

Polypeptide antibiotics

During the past 20 years several polypeptide antibiotics, isolated from *Bacillus spp.*, have had useful clinical applications. It is recognised that these antibiotics fall into two main groups, the gramicidins and tyrocidins and the bacitracins and polymycins. The former are related cyclic decapeptides, active against Gram-positive organisms, and the latter contain a peptide ring joined to a non-cyclic peptide chain through an amino-acid.

Two new types of polypeptide antibiotic have now appeared among the streptomycetes of antibiotics. Those of the first group, comprising amidomycin and valinomycin, contain rings composed of α-hydroxy and α-amino acids linked by alternate peptide and ester bonds. The enniatins, isolated from *Fusarium spp.*, also have this structure.

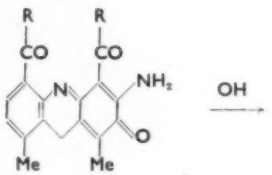
The second group consists of etamycin (viridogrisein) and the actinomycins. Etamycin contains seven amino acid residues in a large lactone ring, among which are the unusual amino acids, α-phenylsarcosine, β-N-dimethyl-leucine and N-terminal 3-hydroxypicolinic acid. It is active against Gram-positive organisms and *Mycobacterium tuberculosis*, but is too toxic for extensive clinical use.

In 1940, Waksman and Woodruff[10] separated a red peptide-containing antibiotic, which they called actinomycin, from the culture fluid of a strain of *Streptomyces antibioticus*. Since that time it has been established that actinomycin-producing organisms generally elaborate mixtures of actinomycins, the complexes A, B and X consisting of the same components, I, II, III, IV and V in different proportions, although actinomycin D is essentially pure actinomycin IV.

Most members of the group are powerful anti-cancer agents, but can cause skin pigmentation, depletion of the bone marrow and gastro-intestinal disturbances in man. The results of clinical trials held in France during 1954 showed that actinomycin C exerted a temporary beneficial effect on 25% of patients with Hodgkin's disease, and beneficial effects were also noted in patients with leukæmia or ovarian carcinoma.[11,12] Farber[13] has described actinomycin D as one of the most powerful anti-cancer agents, by weight, so far discovered; it causes striking regression of various transplanted forms of cancer in the mouse and the hamster and is effective against kidney tumours in children at sub-toxic dose levels.

Apart from their biological activity, the actinomycins are chemically an interesting group of chromopeptide antibiotics.

The actinomycin molecule consists of two peptides linked to a chromophore moiety, 1 : 8 dimethyl-3-amino-4 : 5 dicarboxyphenoxazone (I) which is probably the same for all actinomycins; they differ only in the nature of the amino acids in the peptide portions of the molecule. The chromophore, being a quinone, can undergo reversible reduction, and it also loses its colour on treatment with cold alkali. This colour change is believed to be due to the fission of the oxygen bridge (II) and is reversed by acidification.[14]



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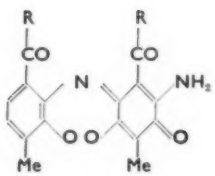

II

The peptide fragments are each composed of five amino acids and contain a lactone ring closed through the hydroxyl group of L-threonine. The amino acid sequences of the characterised actinomycins are shown in Table 1.

It has been recognised for some time that the peptides in the molecule can be modified quantitatively by varying the nitrogen source supplied to the organism. More recently Katz and his co-workers and Schmidt-Kastner have shown

Table 1. Amino acid sequences of actinomycins

Actinomycin	
I	L-Thre.—D-Val—L-Pro—Sarc—N.Me L-Val
	—L-Thre.—D-Val—L-OHPro—Sarc—N.Me L-Val
II	L-Thre.—D-Val—Sarc—Sarc—N.Me L-Val
	—L-Thre.—D-Val—Sarc—Sarc—N.Me L-Val
III	L-Thre.—D-Val—Sarc—Sarc—N.Me L-Val
	—L-Thre.—D-Val—L-Pro—Sarc—N.Me L-Val
IV	L-Thre.—D-Val—L-Pro—Sarc—N.Me L-Val
	—L-Thre.—D-Val—L-Pro—Sarc—N.Me L-Val
	—L-Thre.—D-Val—L-Pro—Sarc—N.Me L-Val
V	L-Thre.—D-Val—L-Pro—Sarc—N.Me L-Val
	—L-Thre.—D-Val—4oxo Pro—Sarc—N.Me L-Val
VI	L-Thre.—D-allo isoLeu—L-Pro—Sarc—N.Me L-Va
	—L-Thre.—D-Val—L-Pro—Sarc—N.Me L-Val
VII	L-Thre.—D-allo isoLeu—L-Pro—Sarc—N.Me L-Val
	—L-Thre.—D-allo isoLeu—L-Pro—Sarc—N.Me L-Val

ABBREVIATIONS

L-Thre.	L-threonine	Sarc.	Sarcosine
D-Val.	D-valine	N.Me L-Val	N methyl-L-valine
L-Pro.	L-proline	4-oxo-Pro.	4-oxo-proline
L-OHPro.	L-hydroxyproline	D-allo isoLeu. ..	D-allo isoleucine

hat the type of peptide produced n the molecule is influenced by the amino acids supplied in the growth medium. Katz and Goss,[15] for example, have shown that L-hydroxyproline increased the yield of actinomycin I from 6% to 31% of the total antibiotic produced by *Streptomyces antibioticus*.

More recently Katz and Goss[16] studied the effect of supplying sarcosine or biochemically and chemically related compounds, such as choline, betaine and serine, to an actinomycin-producing culture. It was found that actinomycins I and II were the major components produced in the presence of sarcosine, whereas actinomycins IV and V were normally produced in greatest amount. The related compounds had little effect on the type or quantity of actinomycin produced. Katz and Goss also found that L-proline and DL-pipecolic acid, a proline analogue, reversed the sarcosine effect and in fact stimulated the biosynthesis of several new actinomycins containing pipecolic acid.

This method of biosynthesis of new actinomycins by the introduction of an exogenous supply of amino acids may well open the way to the production of actinomycins having the same powerful anticancer effects as those already characterised without the same high toxicity.

The macrolides

The macrolides, so named by Woodward on account of the presence of a macrocyclic lactone ring of 12 to 17 carbon atoms in the molecule, were discovered during an intensive search for substances active against antibiotic-resistant bacteria. The lactone ring is always linked glycosidically to one of two closely related dimethylamino pentoses, desosamine and mycaminose; some of the macrolides also contain a second pyranose sugar linked to the lactone ring or the aminosugar.

All members of the group are active against Gram-positive bacteria; carbomycin, erythromycin and oleandomycin are used in clinical medicine, but pikromycin, methyamycin, griseomycin, angolamycin, narbomycin and the spiramycins have not gained any wide acceptance.

Although these lactone rings are complex, Woodward[17] and Birch[18] have suggested that the positions of the double bonds and the oxygen atoms are consistent with the view that the macrolides are biosynthesised by the condensation of simple acetate, or possibly propionate, units. The fact that the macrolide from erythromycin can theoretically be split into seven consecutive three carbon fragments also led to the view that the structure of the group might be predicted by a "propionate rule,"[19] in the same way as the "isoprene rule" has been used in terpene chemistry. Further experimental studies are needed to help decide which of these postulates is correct.

In this group oleandomycin and its triacetylated derivative have recently received a considerable amount of attention. Oleandomycin is elaborated by a strain of *Streptomyces antibioticus*. The structure of the lactone ring has not been elucidated, but oleandomycin is known to contain desosamine and oleandrose, a methyl-methoxy sugar previously found in the cardiac glycoside, oleandrin.

The antibiotic is absorbed rapidly when taken orally and accumulates in the soft tissues. It is active against Gram-positive bacteria, rickettsia and large viruses and, although active against some antibiotic-resistant bacteria, is recognised to be inferior to erythromycin for this purpose.[20] Soon after the introduction of oleandomycin it was reported that a pronounced potentiating effect was produced when it was used with tetracycline;[21] however, Jones and Finland[20] have reviewed the reports on this subject and conclude that such mixtures offer no advantages.

Oleandomycin produces three monoacetyl, three diacetyl and one triacetyl derivatives, all of which are biologically active. The triacetate is a crystalline product without the characteristic bitter taste of the macrolides, being insoluble in water. It is more resistant than the parent compound to acid hydrolysis by the stomach contents and as a result produces higher serum concentrations of the active antibiotic. Despite this higher antibiotic concentration the compound is all the same less effective than erythromycin against antibiotic-resistant staphylococci.[22]

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(*Continued on page* 208)

THERAPEUTICS

By S. J. Hopkins, F.P.S.

Local anæsthetics • Substitutes for insulin • Erythromycin
Xanthocillin • Paralysis agitans • Anti-radiation drugs

(Continued from March, pp. 120—122)

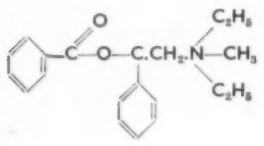
Local anæsthetics

Some interesting compounds have been described by Shapiro[19] *et al.*, following an examination of *bis*-esters of succinic acid of the following general formula:

$$\begin{array}{l} CH_2.COOCH.C_6H_5.CH_2.N.R_1R_2 \\ | \\ CH_2.COOCH.C_6H_5.CH_2.N.R_1R_2 \end{array}$$

Good activity was found when R_1 and $R_2 = C_2H_5$, as the compound was comparable in effect with lignocaine. A similar degree of activity was shown by the corresponding methyl analogue, and this substance, as well as some with a methylene chain, had both local anæsthetic and curare-like properties. This opens up the possibility of preparing therapeutically useful substances possessing both properties, and Shapiro's paper, which describes methods of synthesis, may be the beginning of a valuable research.

Other work on local anæsthetics was concerned with analogues of procaine of the type R—COO—Y—N—R_1R_2, where R = substituted aryl group; Y = alkylene group; and N—R_1R_2 = secondary amino group. The meta analogue [$R_1R_2 = (C_2H_5)_2$] was as active as procaine but less toxic, and in a series with polyalkyloxy substituents on the terminal ring, an increase in activity was noted until the carbon exceeded six atoms. At that point a sharp drop in activity occurred, but was probably due more to solubility factors than structural differences. Certain other compounds examined in the course of this work, notably the following:



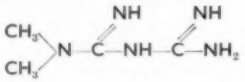
had a marked ability of neutralising the neurotoxic effects of tremorine, or 1·4-dipyrrolidino-2-butyne. The tremor produced by this compound was first noted by Everett,[20] who suggested its use as a screening agent for the examination of anti-parkinsonism drugs. The anti-tremor properties of some of these new compounds may result in the synthesis of drugs that can relieve both the tremor and the rigidity of Parkinson's disease.

A further investigation into the activity of various alkyl esters of N - substituted aminoacylamino - benzoic acids is reported by Epstein and Kaminsky.[21] In this report, which gives methods of synthesis, reference is made to several compounds of relatively high anæsthetic potency, which appear to merit further investigation.

Insulin substitutes

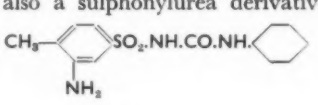
Sulphonamide-based insulin substitutes are represented by tolbutamide, which now has an established place in therapeutics. Work on the guanidines was abandoned when the toxic effects of Synthalin became known, but more recently some substituted diguanides have been investigated (MANUFACTURING CHEMIST, 1959, **30,** 280). Of these compounds, phenyl ethyl diguanide (D.B.I.), appears to be most promising, as it is almost devoid of toxicity. D.B.I., which may also be described as phenyl ethyl-formamidinyl iminourea, was shown to have a hypoglycæmic action by Ungar[22] *et al.*, and the results of a clinical investigation have been reported by Pomeranze[23] *et al.* Glucose tolerance tests indicated that DBI reduces blood sugar levels within 3 hr., and also reduces the insulin requirements of severe diabetics. The mode of action remains to be discovered. It may supplement the action of insulin by promoting glucose utilisation, and may also have a specific effect on the lesion causing the diabetic state. It does not affect the blood sugar level of non-diabetics. In a series of 206 unselected cases of diabetes 63% were controlled by DBI. In some others, gastro-intestinal disturbance was severe enough to limit treatment. Similar results have been obtained by Walker,[24] who was impressed by the action of the drug. He considers that nausea is due to unnecessarily high dose. By beginning with daily doses of 50 mg., increasing slowly to a maximum of 200 mg. daily, nausea was no longer a problem, and Walker considers that the striking absence of toxicity may even allow DBI to be used in the treatment of stable juvenile cases of diabetes.

Fresh interest has also been taken in an associated compound, N : N-dimethyl-diguanidine.



This substance was originally examined by Hesse and Taubmann[25] in 1929, and following the revival of interest in oral anti-diabetic drugs, a number of diguanides have been investigated. Sterne[26] has used N : N-dimethyldiguanide with favourable results, as a high proportion of his series of 88 patients responded. Skin and febrile reactions were absent, although in four cases gastro-intestinal disturbances caused treatment to be suspended. The mode of action of this drug is quite different from that of other anti-diabetic substances, as it is effective even in the absence of pancreatic tissue. Preliminary reports have also been made on the phenylethyl, amyl and isoamyl derivatives.

The effects of both tolbutamide and dimethyldiguanide have been compared by Granville-Grossman[27] with those of two other oral hypoglycæmic drugs, chlorpropamide and metahexamide. Chlorpropamide, or 1-propyl-3-*p*-chlorbenzenesulphonyl urea, closely resembles tolbutamide in structure, but has certain therapeutic advantages. It is a more effective drug, and single daily doses of 200 mg. were frequently sufficient to control the diabetic symptoms. Metahexamide is also a sulphonylurea derivative,



being 1-cyclohexyl-3-*m*-amino-*p*-tolylsulphonyl urea. With a combined diet and drug regimen, an initial dose of 300 mg. can be reduced to 100 mg. daily, and the action is more sustained than that of other drugs. These workers also comment that dimethyldiguanide is not always well tolerated, and make the interesting observation that patients who fail to respond, or respond inadequately to one compound, may be stabilised by combined treatment with two, particularly if one drug is of a different chemical series. This failure to respond to oral hypoglycæmic therapy is linked with difficulty of selecting patients likely to respond. Certain broad generalisations have been made, but beyond this selection is largely arbitrary. Joplin *et al.*,[28] in a report on the persistence of response to tolbutamide, suggest a useful method of reducing these difficulties of out-patient selection. Other reports include that of Jackson[29] and Oakley, who confirm the value of chlorpropamide in the treatment of tolbutamide-resistant diabetics. These investigators point out the possible value of the sulphonyl ureas in juvenile diabetes, by virtue of their action in stimulating the production of endogenous insulin.

Erythromycin

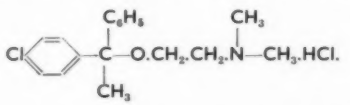
Erythromycin is a powerful antibiotic that is usually kept in reserve for the treatment of resistant infections. Infections apparently resistant to erythromycin are also increasing, and Smith and Soderstrom[30] have examined the relationships between response, and the blood levels of the antibiotic produced by various derivatives. Erythromycin stearate has been used, but these workers found the propionic acid ester much more satisfactory. A peak concentration four times that following stearate administration was achieved, and with little gastric disturbance. This rapid absorption suggests that the minor digestive upsets experienced with other erythromycin compounds may be due to residues of unabsorbed erythromycin remaining in the intestines. Clinically, good results were obtained, and some apparently resistant infections responded to the higher blood levels that followed the use of erythromycin propionate.

Xanthocillin

This antibiotic, originally obtained from cultures of *Penicillium notatum* by Rothe,[31] is a mixture of two closely related compounds. Although too toxic for systemic use, it is effective against most Gram-positive and Gram-negative organisms, and it also has some suppressive action against certain pathogenic fungi and yeasts. Cross-resistance to other antibiotics has not been reported, and the sensitising power of xanthocillin appears to be low. These considerations have led to the use of xanthocillin locally in the treatment of difficult dermatological conditions such as seborrhœic dermatitis, weeping folliculitis and varicose dermatitis. The significance of infection in these conditions is not clear, but antibiotic applications frequently bring about a rapid if temporary improvement. Bettley[32] has used xanthocillin cream in such cases with favourable results, often when other antibiotics have failed. These results, and the absence of any irritant or toxic properties of the cream, indicate that xanthocillin may prove of considerable value in certain dermatological conditions.

Paralysis agitans

A wide variety of drugs is available for the treatment of this disease, but none is entirely satisfactory. Many patients derive little benefit, others cannot tolerate adequate doses, and as treatment is palliative and not curative, long-term therapy is essential, which in turn may lead to a waning response. Alternative drugs are therefore useful, and chlorphenoxamine, described by Doshay and Constable,[33] has certain advantages. This new compound is β-dimethyl - aminoethyl (*p* - chlor - α - methyl - benzhydryl) - ether hydro-



chloride, and is a derivative of diphenhydramine. That well-known antihistamine has itself been used in parkinsonism, and modifications in structure to form chlorphenoxamine result in a reduction in the antihistamine action and an increase in the anticholinergic properties. In a clinical trial with 136 patients, over 50% were improved, particularly those in the older age groups. It was least effective where tremor was marked, and in such patients combined therapy with other drugs afforded the greatest relief. The possible value of certain compounds derived from procaine is referred to under Local Anæsthetics.

Radiation injuries

Reactions due to X-rays appeared soon after Roentgen's discovery in 1895, as the first cases of radiation dermatitis were reported in 1896, and radiation-produced cancer was noted in 1902. Improved techniques and apparatus have reduced the risks to personnel, but the therapeutic use of ionising radiations cannot be dissociated from the risk of tissue damage, in particular those changes which may occur long after the original exposure. A.C.T.H. and cortisone are known to have a powerful suppressive effect on tissue reactions to injurious stimuli, but in the treatment of irradiation damage these drugs have proved disappointing. Glicksman[34] *et al.*, in dealing with the irradiation reactions shown by patients with carcinoma of the thyroid, noted that the hyperthyroidism appeared to have some beneficial effects on the post-irradiation manifestations. Attempts were then made to use thyroid hormones in cases of longer-standing irradiation changes, and on the grounds of its prompt action and rapid excretion, 3·5·3′-L-tri-iodothyronine was selected for trial. In a series of 69 patients, some with radiation damage from treatment 2 to 30 years earlier, well over half showed definite improvement. This response in certain types of radiation damage suggests changes in such tissues can be further modified by changes in the physiological structure and environment. If that is so, such late radiation changes must exist in a dynamic state, and may be reversed to some extent by effecting an alteration in the metabolism of the damaged cells. Further research may result in the discovery of other compounds with a more specific action, coupled with a reduction in ordinary thyroid activity. This would enable a higher tissue concentration to be achieved, with possibly greater effect. Triiodothyropropionic acid and triiodothyroacetic acid are already being investigated in this way.

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(*Continued on page* 208)

PLANT AND EQUIPMENT

▶*p*H METER

The new Marconi laboratory *p*H meter, Type TF 1093, is a mains-operated high-stability instrument, intended for use in conjunction with a glass electrode system to give a direct indication of *p*H from 0 to 14. Any section of the scale can be expanded over a centre-zero incremental range of ±1·4 *p*H, enabling small changes in *p*H to be measured with a discrimination of better than 0·01 *p*H. The main and incremental ranges are provided with independent buffer controls to enable accurate cross-correlation to be carried out. There is a ±2 *p*H incremental switch for buffer solution extension or self-check. Full automatic compensation for solution temperature is provided.

The instrument also measures voltages in the ranges 0 to 1,400 mV and ±140 mV with the same high input impedance and stability as for *p*H measurement. This extends its use to such applications as rH or corrosion-potential measurements.

A compartment in the rear of the instrument provides secure stowage for the temperature compensator, and the stand, electrodes and buffer solution tablets available as accessories.

Combined direct-reading *p*H meter and high impedance DC millivoltmeter by Marconi.

▶ELECTRONIC CONTROL SYSTEM

Fielden Electronics Ltd. have designed a system to cover all units necessary to the control of a plant including transmitter, indicators, recorders, controllers, electro-pneumatic converter, positioners for pneumatic or electrically operated valves. It is a complete system from variable to control valve.

Special features include:

- D.C. transmission free from effects of pick-up and lead length.
- Safe, low energy transmitters on plant.
- Moving coil meters can be used for indication.
- Choice of three displays when using controller.
- Complete flexibility for use in hybrid electronic/pneumatic systems.
- Drift free controllers.
- Low maintenance and capital cost.

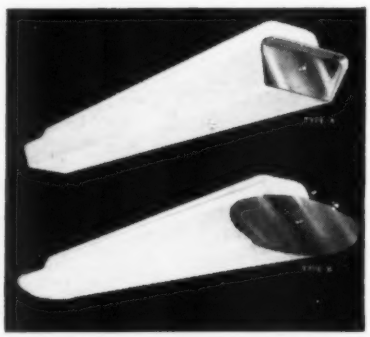
Whilst all the units have been designed to fit into the complete system, individual units may be used to solve particular measurement problems. For example, remote indication of temperature, pressure, level, flow, etc., can be achieved with just the appropriate transmitter and a moving coil meter.

▶FLUORESCENT LIGHTING

The Benjamin Electric Ltd. have introduced the *Litemaster* range of commercial fluorescent light fittings. The complete range is built around two basic units which, in themselves, are easy to install and maintain; variations to suit personal taste are made possible by the introduction of colour and shape to the end feature.

Ribbed acrylic plastic diffusers are produced in distinctive styles to present interest in light and shade at the surface and definition to the form.

These diffusers slip instantly into position on the channel, and are just as easily disengaged, all that is necessary being to remove one end plate by means of the small captive nut which engages in a securing strap attached to the lampholder plate, when the diffuser can then be detached from one side and will hang from the channel on the other side, giving ready access for relamping, cleaning and maintenance.



New fluorescent lighting fittings by Benjamin Electric.

There are two basic models, A and B, differing in size and shape, all fittings being available for ceiling or pendant mounting, while the range covers:

Single 4 ft. 40 watt lamp
Twin 4 ft. 40 watt lamps
Single 5 ft. 80 watt lamp
Twin 5 ft. 80 watt lamps

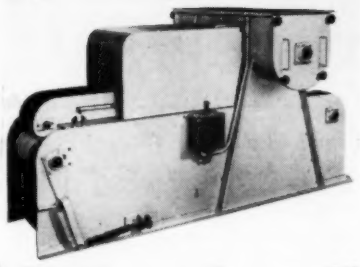
Type A is available with stepped end-plates, to allow light to flow from the extremities of the plastic diffusers, thus reducing end shadow to a minimum—or with enclosing end covers to meet other decorative needs.

Type B is available with enclosing end covers only.

All end plates and covers are made in metal and are available in four colours. Additionally, these end plates and covers are offered with sparkle holes, if desired.

▶STORING, WEIGHING AND FEEDING

Wm. Gardner and Sons (Gloucester) Ltd. have designed a machine to store, weigh and feed at a predetermined rate materials which are normally difficult to handle by conventional methods. The apparatus will handle materials such as wood shavings, soft brown sugar and damp granulated products.



The Gardner stirred bunker and belt feeder unit for difficult materials such as damp, granulated products.

The unit (Gardner British Patent No. 6059/59) has a wide application in the chemical industry where today difficult materials have to be handled and weighed by hand. It is based on a bunker which is fitted with an internal slow running agitator of special construction. The agitator keeps the materials "live" within the bunker and prevents any tendency to bridge. A small volume of the "live" material is delivered through an opening in the side of the bunker and the same total volume is always present within a container at the side of the bunker. By this means the density of the material available is not likely to vary owing to a variation in the amount present in the main bunker.

The associated feed mechanism consists of a belt which draws a layer of the material forward. While at this point most feeders have a stationary gate to control the level of the material on the belt, Gardners use a rotating trimmer of special design. When a stationary gate is used in normal machines, materials tend to build up behind the gate, with the result that there is a very uneven flow on the belt, but the Gardner trimmer eliminates the build-up tendency so that the belt draws forward a level carpet of material giving a volumetrically constant output.

The feeding belt is often fitted with a weighing mechanism which "senses" the weight of the material on the belt any time. By using a suitable feed-back system giving signals to a controlling device the height of the rotating trimmer is adjusted and thus the thickness of the carpet on the belt. The belt is therefore carrying a compensated amount of material and delivers a regular weighed quantity of material per minute, even although the density of the presented material in the original bunker may vary throughout the run. The unit has been supplied with bunkers of large capacities and the belt feeders have been arranged to give varying outputs automatically controlled, as required by process engineers.

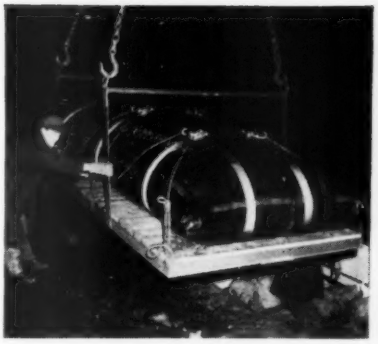
The degree of accuracy possible is dependant on the type of material but with such widely differing materials as wood chips and castor sugar, accuracy better than $\pm$ 1% by weight has been achieved, it is claimed.

▶OIL v. COAL FOR STEAM RAISING

Robinson Brothers Ltd., a medium sized firm of chemical manufacturers in West Bromwich, manufacture a wide range of industrial chemicals and, in common with other chemical manufacturers, use a large amount of steam for both process and space heating purposes. The original steam raising equipment installed in the works comprises three coal-fired Lancashire boilers, two of which were fitted with mechanical stoking equipment. As is normal, however, with chemical plant, the processes carried out at Robinson Brothers require a constant steam pressure at varying loads. In an effort to obtain a boiler which would meet the heaviest load experienced in the factory, and provide an alternative to solid fuel with its attendant problems, the company bought a model 300 *Powermaster* oil boiler from G.W.B. Furnaces Ltd.

Due to the fully modulating controls on the boiler, changes in steam demands can be catered for without a drop in steam pressure. The boilers are packaged automatic units of the super-economic type with three-pass gas travel. A series of 16 models is manufactured giving steam outputs from 517 lb. to 20,700 lb. of steam per hr. The firing system is subject to fully modulating control operating from 20% to 100% of the boiler capacity maintaining correct fuel/air ratios so that efficiencies of over 80% are obtained on full or part loads. The adjustable cam positions for the fuel valve and air shutter are pre-set in the manufacturer's works where a comprehensive fire test is carried out on each boiler before dispatch to the customer.

Having experimented considerably with coal-fired and oil-fired boilers, Robinson Brothers have been able to make a number of useful comparisons.



Flexible tank.

It has been found that the *Powermaster*, using 3,500 secs. oil, produces 12·5 lb. of steam per lb. of oil. The condition and quality of coals appear to vary considerably, but the latest figures show that 1 lb. of coal produces 5·2 lb. of steam. On fuel costs alone, a ton of steam produced by coal would cost approximately 18s. 3d. and, using oil, would cost 15s. Electrical equipment on the *Powermaster* adds approximately 9d. a ton to the oil firing cost, whilst water treatment costs are about the same for both types of boiler. Hauling of ashes and handling of coal adds further to the cost of running a coal-fired boiler, which costs are not encountered with the *Powermaster*.

The *Powermaster* takes up less space than an equivalent rated coal-fired unit, and oil tank storage eliminates the handling difficulties associated with solid fuels. Operation is smoke-free, and the boiler-house is a much more pleasing place to work in.

▶FLEXIBLE TANK ON TRIAL

A trial shipment of liquid by *Portolite* flexible tank across the North Sea has proved successful. The tank, lashed to a hatch in the bows of the ship, stood up well to the trip, even during a force 8 gale.

The trial was undertaken by Marston Excelsior Ltd., the manufacturers of the tank, in collaboration with the Holland Steamship Co. and the British Amsterdam Maritime Agencies Ltd., Hull.

British Maritime Agencies are interested in shipping bulk quantities of cod liver oil, photine and tannin oil from Hull direct to customers on the continent.

In the opinion of the captain, *Portolite* is a safe and stable deck cargo.

BOOK REVIEWS

Introduction to Chemical Nomenclature

By R. S. Cahn. Butterworths, 1959. *Pp.* 98 *inc. index.* 10*s.* 6*d. net.*

In this little book the author—an acknowledged expert (he is editor to the Chemical Society)—sets himself the limited but valuable objective of describing for chemists the principles of chemical nomenclature, particularly of modern systematic nomenclature. Brevity has not been achieved merely by omitting the harder points. Dr. Cahn tries to mention any further complexities and to say where they are discussed.

After an introductory chapter on the use and misuse of chemical nomenclature there come eight chapters on: inorganic, organic: general, organic: the principal functional groups, organic: numbering, organic: building a name, organic: skeletal types, organic: some special cases, and physico-chemical symbols.

The book is not a successor to Dr. A. D. Mitchell's *British Chemical Nomenclature* and the introductions to *Chemical Abstracts* indexes. This will have to wait until the work by I.U.P.A.C. on functional groups has progressed further. But it is a valuable guide to better communication between chemists.

Drug Research

Fortschritte der Arzneimittelforschung. Vol. I, Editor Ernst Jucker. Birkhäuser Verlag, Basle and Stuttgart, 1959. *Pp.* 607. 68 *Swiss Francs net.*

With drug research inevitably continuing towards greater specialisation, it is becoming increasingly difficult to form a clear picture of the whole field. The research worker who wishes to put his own immediate sphere of activity into perspective is forced to turn to a general summary of progress. Equally in need of such a summary are those outside the laboratory who have to keep up with drug research.

It is for this reason that the publication of the first volume of a new series with the avowed aim of bridging the gulf between technical journals on one hand and standard textbooks on the other is of major interest.

Each year it is intended to publish a volume of authoritative reviews on selected topics, to be discussed from the chemical, pharmacological and clinical points of view. Particular emphasis is being placed upon the relationship of chemical structure and biological activity. Thus, in the course of a few years Dr. Jucker hopes to cover broadly the whole field of drug research.

The articles in this first volume are authoritative, well documented with references and of a length commensurate with the scope of the series. The volume is beautifully produced and printed, and the information is up to date.

It appears that the series is intended to be trilingual, although French does not occur in this first volume, two of the papers being in English and five in German. Multilingual scientific publications have become firmly established on the Continent, but in this work the absence of translations detracts from its usefulness to English readers. A translation of the whole volume would be welcome.

This applies particularly to the general survey article on drugs introduced over the last five years, which is in German. Here is a valuable concise summary giving the chemical name and structural formula of each drug, its common name, and well-known brand names and the manufacturers concerned. The salient points of biological and clinical interest are briefly stated and the key literature references are cited. The drugs are classified according to pharmacological criteria and where necessary subdivided into groups of chemically related substances. Understandably, there are some omissions, for example X-ray contrast media and choleretic agents. There is also undue emphasis on continental brands of drugs that are available in several countries.

Of the remaining papers, it is a little surprising that ion exchange agents have been chosen for the very first paper since they are hardly in the main stream of drug research.

On the other hand, the second paper (in English), "Cholesterol and its Relation to Atherosclerosis," is a very topical one.

This is a very lucid introduction to the subject, references are numerous and there is an extensive catalogue of cholesterol-reducing drugs classified by countries of manufacture.

Both the next two papers deal with helminthology, the first with parasitological aspects and the second with chemotherapeutic developments; there is some overlap.

The longest article, "Das Placeboproblem," is a comprehensive review of clinical trial results for recent drugs, arranged in pharmacological groups.

Finally, a paper on Stereochemical Factors in Biological Activity has been contributed by A. H. Beckett, whose challenging theories of physiological activity as a function of the spatial relations of the drug-receptor combination have aroused a great deal of interest in this country.

S. K. Hudson.

Ammonia

Manufacture and Uses. By A. J. Harding. Oxford University Press, 1959. *Pp. xiii* +41. *Illustrated.* 6*s.* 6*d. net.*

This short book describes the manufacture and uses of what is perhaps the most important chemical man has learned to synthesise. The synthetic ammonia industry was founded less than 50 years ago and it remains an outstanding example of the genius of chemists overcoming a shortage of an essential material—nitrogen—which threatened food supplies and led to Sir William Crookes's famous warning to the British Association in 1898. There are three chapters: manufacture, properties and technical data, and uses. The first is the longest and demonstrates the application on a massive scale of principles ranging from the gas laws to simple thermodynamics. The largest use for ammonia is, of course, to manufacture fertilisers. A table of U.S. consumption shows that 76% is used for this purpose. But it enters into many other fields of industry, most of which are briefly mentioned.

The book has been prepared by I.C.I. with the assistance of the Science Masters' Association and the Association of Women Science Teachers. It is intended for senior schoolchildren and junior students in technical colleges and universities.

Soviet Research in Pharmaceutical Chemistry 1956

I—Pharmaceutical Chemistry; II—Medicinal Chemistry; III—Pharmacognosy. Consultants Bureau, New York, 1959. *Pp.* 603. $60.

THIS is a collection of translations of papers published originally in Soviet scientific journals during 1956. One assumes that the selection of papers is restricted to the seven important Soviet journals quoted, but the reader is not told how the selection is made or how complete it is. The fact that this publication of late 1959 refers to original publications in 1956 is to be regretted, but one hopes that with the increasing flow of scientific information across the Iron Curtain it will be possible to publish more promptly.

Part I contains the translations of 23 papers; 8 deal with the use of ion exchange methods (6 refer to antibiotic separation) and the remaining 16 are a heterogeneous collection ranging from the identification and estimation of barbiturates to the study of the protective action of substances on the irradiation of protein solutions.

One cannot help feeling with many of these contributions that the work has been done in isolation. For instance, the paper on the microcrystalloscopic identification of barbiturates begins with a statement that "some papers have already been devoted" to this topic, and then gives only three references and those to Russian journals. It is not difficult to think of other contributions that might have been mentioned.

Part II, over 400 pages, deals with the synthesis of medicinal substances and contains the translation of 77 papers, 13 of which deal with antiinfective substances, 8 with steroids, 36 with heterocyclic compounds with a variety of applications, and the remaining 20 are classed as miscellaneous and range from aromatic chemicals to local anæsthetics.

There are sharp contrasts in the quality of these papers; on the one hand there is a publication on chloromycetin which quotes a very extensive bibliography and puts forward a convincing case that some of the conclusions reached by the earlier British workers were erroneous; at the other extreme we have papers describing minor modifications in the laboratory synthesis of well-known compounds, such as isonicotinic acid, showing such marginal advantages over previous published methods that one wonders whether they merit publication at all, still less translation and republication.

Part III comprises 19 papers, all concerned with natural products, mostly alkaloids, extracted from plants indigenous to Soviet territories. Although some of it is of limited practical value because many of these plant materials are not available in the Western world, the relation of these products to those already known is of undoubted interest.

The translators must be congratulated on producing a readable text, which is reasonably free from typographical errors. One possible source of confusion lies in the use of translated titles for Russian journals, with no indication of their origin. This results in such references as *J. Applied Chem.* when, in most cases, *Zhur. priklad. Khim.* is meant rather than the product of Belgrave Square.

K. GAIMSTER.

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Progress in Nuclear Energy

Series IX. Analytical Chemistry, Volume 1. Editor: M. T. Kelley. Pp. 370. *Pergamon Press,* 1959. £5 5*s. net.*

THIS volume contains a selection of the papers presented at the Second United Nations Conference on the Peaceful Uses of Atomic Energy, held in Geneva. The papers are international in character and are divided within the volume into five sections: Reactor Applications, Activation Analysis, Spectrographic Techniques, Industrial Applications and Health Physics.

It was the intention of the editor and his advisers that the papers included should give a balanced view of the work of the Conference in connection with the progress of analysis in the field of nuclear energy. Emphasis is placed on methods of analysis as applied to materials peculiar to the atomic energy programme, and the uses of neutron activation analysis, radioactivation analysis, X-ray spectrophotometry and many other methods are discussed.

Although much of the work, when viewed from the standpoint of the industrial chemist, is highly specialised, there are a number of papers of general analytical interest, *e.g.* on neutron activation analysis, on the determination of trace impurities in pure materials by radioactivation analysis, and on gamma-ray spectrometry. The section on industrial applications is also of wider interest and exemplifies the extent to which radioisotope methods can be applied. It is both interesting and instructive to note the extent to which complex problems can be solved by physicochemical analysis when sufficient time, energy and money are available.

R. E. STUCKEY.

A Guide to the Identification of the Genera of Bacteria

By V. B. D. Skerman. 1959. *Williams and Wilkins, Baltimore. Pp.* 217. 44*s. net.*

DURING the last 40 years or so there has been a vast amount of descriptive work published on both old and new types of bacteria. Dr. Skerman's book summarises this work in the convenient form of a guide to bacterial taxonomy and identification.

Much of the material in this book has been published, in slightly different form, in the 1957 edition of Bergey's "Manual"—that taxonomic tome in which all bacteriologists, though ever in search of a "better 'ole," are frequently forced to take refuge.

The present volume, however, forms an invaluable handbook for all students of bacterial taxonomy, and contains a series of excellent microphotographs of certain less common genera. The book opens with a comprehensive dichotomous key (48 pp.) to the genera of bacteria; this is essentially the same as that which the author contributed to the "Manual." Then follows a very useful Digest of Genera (94 pp.) stressing the differentiating characters of each genus.

The final section (63 pp.), on Methods, lists various techniques and media recommended by the author. The book is well indexed, and includes a brief Guide to Study, or synopsis of the various bacterial groups.

L. D. GALLOWAY.

Lipsticks, Vaccines, Sprays, Antibiotics and Feeds

The Home Secretary, Mr. R. A. Butler, promised a woman M.P. in the Commons last month (April) that if she had evidence that any substance used for colouring lipstick was poisonous he would consider it.

The question was raised by Mrs. Joyce Butler (Labour, Wood Green), who asked what steps were taken to "control the use of poisonous substances as colours in the manufacture of lipstick on sale in the U.K." Mr. Butler replied that substances included in the Poisons List were subject to appropriate measures of control under the Poisons Rules.

Earlier, Mrs. Butler had questioned the Parliamentary Secretary to the Ministry of Health, Miss Edith Pitt, as to what regulations covered the substances used to produce colours in lipstick. The reply was that there were no regulations within the purview of the Ministry, but if the member was implying that any substances were poisons, it was a matter for the Home Secretary.

Tax on husk vaccine

An explanation was given by a Treasury spokesman about the circumstances in which the vaccine *Dictol*—used against husk disease in animals—was freed from purchase tax after representations to the government.

Mr. Anthony Barber, Economic Secretary to the Treasury, told Mr. Harold Boyden (Labour, Bishop Auckland) that Dictol was exempted from tax following production by the manufacturers of further evidence from independent veterinary surgeons about the efficacy of the vaccine under field conditions. Mr. Boyden protested that farmers had been "mulcted of tax under false pretences."

In 1958, he said, 8,000 animals on 260 farms were tested and last year tens of thousands of animals had this vaccine with satisfactory results. Yet when the matter was raised in Parliament in February, the Economic Secretary had stated that further researches were taking place. Mr. Barber said that as late as March 8, 10 and 15 the Treasury was given a considerable amount of further new evidence from 50 independent veterinary surgeons and as a result Dictol was soon afterwards exempted. He added that it was up to the manufacturers to produce evidence for tax exemption.

Tests of sprays and fertilisers

Mr. Geoffrey de Freitas (Labour, Lincoln) wanted a service set up, on the lines of that provided for consumers of domestic goods by the Consumers Association, for the compulsory testing of sprays and chemical fertilisers offered for sale to farmers.

A spokesman for the Minister of Agriculture said the present statutory and voluntary arrangements were adequate. The arrangements, which were extensive, were kept under review. He pointed out that the Fertiliser and Feeding Stuffs Act stipulated that producers must be provided with information about the composition of these commodities when they bought them.

Antibiotic feeds

In the House of Lords, Lord Douglas asked about the extent of the use of antibiotics in the feeding of animals intended for human consumption.

Earl Waldegrave, Joint Parliamentary Secretary, Agriculture Ministry, explained that the sale or supply of compound feeding stuffs and supplements containing antibiotics, other than on veterinary prescription, was confined by law to pig and poultry foods containing penicillin, aureomycin or oxytetracycline (often known as Terramycin). Under the regulations, inclusion of these substances in manufactured feeding stuffs was restricted to food for young pigs and poultry intended for early slaughter. The feeding of antibiotics which might lead to improved rates of growth and better food conversion was thought to be fairly widespread, Earl Waldegrave added, telling the House that a joint committee of the Agricultural Research Council and the Medical Research Council was to review the whole situation.

Oral contraceptives

A woman M.P. on the Government side, Miss Joan Vickers (National, Liberal and Conservative, Devonport), suggested that the Health Minister should refer the claims made for oral contraceptives to the Medical Research Council, and arrange for the Council to conduct tests with adequate safeguards against undue risks to volunteers from side or long-term effects.

She was told by Mr. Derek Walker-Smith that this was not necessary. "I am informed that the M.R.C. has this whole subject very much in mind, and has for long been sponsoring fundamental research into the factors affecting human fertility and infertility," he said.

Technical Press Review—May

Chemical and Process Engineering.—Materials of Construction: Rigid PVC, High impact PVC, Compounding of PVC against gamma-ray irradiation; New Canadian technique for waste disposal; Uranium extraction in France; Elements of Chemical Engineering; What can be patented?

Corrosion Technology.—Corrosion of Titanium and Zirconium; Design for Pipelines—2; Cathodic Protection; Corrosion of Stainless Steel by Dilute Nitric Acids at Elevated Temperatures and Pressures.

Fibres and Plastics.—Polyethylene in Paperboard Coatings; Synthetic Fibres in Paper Manufacture; Process Control Instruments; Rovana Microtape; Radiation of Polymers.

Food Manufacture. — Latham Foods Ltd. Factory Visit; Review of Mechanical Handling Exhibition, survey of equipment mechanisation of food plant; World Food Supplies—4.

Paint Manufacture.—Mechanical Handling Exhibition; Advanced Paint Chemistry—9; Segregated Pilchard Oils—2; Styrenated Epoxide Esters.

Petroleum.—Tank Truck Design: Theory and Practice; Underground Oil Storage; Density Determinations in Refinery Tankage; Bulk Storage and Distribution: Equipment Review; Natural Gasoline Recovery, Some Economic Aspects.

World Crops.—Impressions of Kenya by W. Leonard Hill; Portuguese Resettlement Project; Salt Marshes and Salt Deserts; Scald Reclamation with Primary Cover Crops.

For specimen copies and subscription forms apply to the Circulation Manager, Leonard Hill House, Eden Street, London, N.W.1.

NEWS . . .

A.B.P.I. annual dinner

Clinical trials—a decision soon?

Two recommendations of the Hinchliffe committee on the cost of prescribing are being actively considered by the Minister of Health and decisions can be expected soon. They are the setting up of a clinical trials committee and the establishment of an advisory body on pharmaceutical service costs. This was announced by Miss Edith Pitt, Parliamentary Secretary, Ministry of Health at the annual dinner of the Association of British Pharmaceutical Industry in London on April 26. Miss Pitt congratulated the record gathering of industry leaders on the progress made in providing new drugs and the fine export achievements (£40 million in 1959, more than a quarter of total output). On **prices,** Miss Pitt said that the Voluntary Price Regulation Scheme was due for revision in June. Ministers wanted no more than fair and reasonable prices but thought some manufacturers could still cut prices without damaging research and development potential.

Research, prices and exports were among the topics discussed by the president, Mr. E. D. Carey in his speech. There was plenty of material for such speeches, he said, since the industry had assumed a "goldfish bowl existence." Why was the industry so frequently criticised? Its exports were good. Its prices were only 1·4% higher than in 1954 though those of all manufactured products were up by 11·4%. It took part in the voluntary price regulation scheme and additional savings were made by production economies. Was advertising the reason for criticism? If so, Mr. Carey said, he would remind the critics that advertising was the truth in its most attractive form and that the A.B.P.I. code insisted on truth. As for **research,** the industry was spending £5 million a year and was now to be given the opportunity of developing M.R.C. discoveries.

New president

The speech was Mr. Carey's final one as president. He is succeeded by Mr. H. W. Palmer, managing director of Glaxo. Dr. D. E. Wheeler, managing director of the Wellcome Foundation, is vice-president.

Queen Mother opens Pharmacy School in Brunswick Square

"This must be the oldest new building in London," quipped Queen Elizabeth the Queen Mother, when she opened the Brunswick Square building of the School of Pharmacy, University of London, on April 27. Her Majesty, who is Chancellor of the University, was referring to the chequered history of the building which was begun in 1938 but which, owing to the war and financial difficulties, was not completed until recently. The Queen Mother referred to the success of the School, particularly in the past thirty years since it had become a school of the University. She said the Pharmaceutical Society could be proud of the School which it had founded 118 years ago and hoped that it would still give support even though the School was now independent.

The Queen Mother was introduced by Sir Harry Jephcott, chairman of Glaxo, in his capacity as chairman of the School Council. He outlined the history of the School and mentioned the help it gave to overseas pharmacy colleges. At present there were 30 overseas undergraduates and graduates.

The thanks of the School were expressed by the Dean, Professor W. H. Linnell. His regret was that it was too small to meet today's needs. Each year there were 400 candidates for 48 undergraduate places. Further expansion was needed and acquisitive eyes were looking at neighbouring buildings.

After unveiling a commemorative plaque the Queen Mother toured the laboratories and afterwards took tea with the students. The pleasant ceremony took place on a brilliantly sunny afternoon and a suitably royal atmosphere was evoked by the band of the Welsh Guards.

Goya bought by Reckitts

One of Reckitt's subsidiaries, Reckitt and Sons, has bought for cash D. R. Collins, which, either directly or through subsidiaries, has a substantial business in the field of perfumery, cosmetics and female and male toiletries. Collins' best-known trade mark is *Goya*.

Three directors of Reckitt and Sons—Mr. B. N. Reckitt, Mr. J. H. Chapman and Mr. R. S. Howard—will join the Collins Board. Mr. Douglas Collins, chairman and managing director of Collins, will remain in office as will his other executive directors.

No financial details of the deal have been released, but the *Financial Times* reported that Collins has an authorised capital of £300,000, and it is believed that the price paid was several times that figure.

SKF's £1m. HQ opened by Health Minister

The Minister of Health, Mr. D. Walker-Smith, opened the new building of Smith Kline and French Laboratories Ltd., at Welwyn Garden City, Herts., on April 28. The £1 million building houses offices, laboratories, pharmaceutical production and the SKF Research Institute.

It is the first stage of development since SKF bought their English agents, Menley and James, in 1956 and took over the conduct of their own business in the U.K. Since then the company has grown to employ over 500 people in the U.K.—100 of them representatives—and has a turnover of about £3 million, approximately one-third of which is overseas business.

The building stands in 9 acres on the edge of Welwyn Garden City and has pleasant rural aspects on two sides. It provides 164,000 sq. ft. of which 37,000 are allotted to research and development and almost 70,000 to production. The laboratories include chemistry, biochemistry, analytical pharmacy and pharmacology. There is an animal house of 8,000 sq. ft. Although the handsome red brick building has only just been opened it is already too small and new building will start in July (see p. 205 this issue).

Minister's speech. The company's more recent products are in the field of psychiatric medicine and include products like *Stelazine*, *Dexedrine* and *Drinamyl*. These products were referred to by Mr. Walker-Smith who said that two out of five hospital beds in the U.K. are occupied by mental patients. He said that research was essential and had to be paid for—even unsuccessful research—out of the price manufacturers got for their drugs. Nevertheless he as Minister had to see that the public got good value for the money they paid for drugs through the N.H.S. His was a formidable task, bearing in mind that hospital costs alone amounted to five times Mr. Gladstone's total Budget 100 years ago. Mr. Walker-Smith finally praised the SKF Research Institute and congratulated the company on getting Prof. W. A. Bain, formerly occupant of the Chair of Pharmacology at Leeds, to head it.

The Minister had been introduced by Mr. Richard Pfizenmaier, the young (40) managing director of SKF Laboratories Ltd. Among the points he made was that the research laboratories cost half of the £1 million spent on the building.

The final speaker was Col. Tufton Beamish, a Tory M.P. and a director of the company. He said Mr. Pfizenmaier was the only American in the company. He too mentioned research and said that in the U.S. SKF had spent $70 million on research since 1950. This year they would spend $13·5 million.

Besides the premises at Welwyn, SKF have a chemical factory at Tonbridge, Kent.

People

The board of the British Petroleum Co. Ltd. announce that **Sir Neville Gass,** having reached normal retirement age, is relinquishing his appointment as chairman on June 30. The board have appointed the **Hon. M. R. Bridgeman** to be chairman and **J. M. Pattinson** to be a deputy chairman. **M. A. L. Banks** will fill the vacancy on the board caused by the retirement of Sir Neville Gass.

At his own request, **Sir William Garrett** has relinquished his executive responsibilities with Monsanto Chemicals Ltd. to devote more time to other interests. He will continue as a member of the board. Since 1957 Sir William had, among his other executive activities, held the position of personnel director of Monsanto Chemicals Ltd. These duties will now be assumed by **N. F. Patterson,** director in charge of engineering and purchasing.

Sir William is chairman of the Association of British Chemical Manufacturers and a director of Metal Industries Ltd.

D. R. Mackay has been appointed regional manager of I.C.I. Midland sales region in succession to **T. H. Minton,** who has retired after 38 years' service. Mr. Mackay, who is 56, has been regional manager of the company's Scotland and Northern Ireland sales region since 1957. He is succeeded by **J. P. Dickson,** who has been assistant I.C.I. sales controller in London since 1958.

Laporte Industries Ltd. announce that **Alexander Miller Fenton** retired from his appointments as a director of the Sheffield Chemical Co. Ltd., James Wilkinson and Son Ltd. and Glebe Mines Ltd. on March 18, 1960. As from July 14 **James Jones** will relinquish his duties as executive chairman of Laporte Acids Ltd., the Sheffield Chemical Co. Ltd., James Wilkinson and Son Ltd. and Glebe Mines Ltd. He will continue to be a director of Laporte Industries. Upon the retirement of Mr. Jones, **C. B. Bolland,** at present a deputy chairman of Laporte Acids Ltd. and a director of the Sheffield Chemical Co. Ltd. and James Wilkinson and Son Ltd., will assume the chairmanship of those companies and also of Glebe Mines Ltd.

H. L. Salter has been appointed a director of the Fullers' Earth Union, Ltd.

J. Young, F.R.I.C., M.I.CHEM.E., retired at the end of March from his post as general factory manager at the "Ovaltine" works of A. Wander Ltd. at King's Langley. Mr. Young has been 41 years with the company, 23 years as factory manager. He has been succeeded by **R. W. Peevers,** B.SC., A.R.I.C., who has resigned his previous post as works director of British Schering Manufacturing Laboratories to take up this appointment.

The Shah of Persia and his Prime Minister, Dr. Eqbal, visited the Darou Pakhsh Welfare Organisation in Teheran recently. This visit followed the signing of the building contract for the pharmaceutical factory which is to be erected near Teheran by Darou Pakhsh in co-operation with Allen and Hanburys Ltd. The photo shows, from right to left, the Shah, Dr. Eqbal and Mr. W. C. Caswell, M.P.S., of Allen and Hanburys.

Shell Chemical Co. Ltd. have appointed **R. N. Wheeler** to the staff of Egham technical service laboratories. He will be particularly responsible for technical liaison with Government departments and official bodies.

R. D. Pullman has been appointed building and engineering buyer for Boots Pure Drug Co. Ltd. He succeeds **C. H. Tomlinson,** who has retired after 47 years' service with the company. A Nottingham man, Mr. Pullman joined Boots from Repton School in 1933.

John B. Robinson, son of E. B. Robinson, managing director of the Box Division of Robinson and Sons Ltd., Chesterfield, who is assistant works manager at Portland Works, has been appointed a director of the Box Division.

E. E. Clayton has joined the board of Beecham Overseas Ltd. as administrative director. **F. S. Lomax** has joined the board of Beecham Research Laboratories Ltd. as export director. Until recently he was managing director of the Group's subsidiary in Dublin. **K. A. B. Moore,** A.C.A., has joined the board of Beecham Pharmaceuticals Ltd. as administrative director. He was formerly secretary of another company in the Beecham Group, County Laboratories Ltd.

Charles H. Sommer has been elected president of Monsanto Chemical Co., St. Louis, U.S.A., in place of **Charles Allen Thomas,** who has been elected board chairman. The previous chairman, **Edgar Monsanto Queeny,** son of the company's founder, remains a member of the board and chairman of the finance committee.

Mr. Sommer, who is 49, was elected executive vice-president and board member of Monsanto Chemical Co. in 1949. He joined the company in 1934.

S. E. Chaloner has been appointed Controller of Personnel of Monsanto Chemicals Ltd. and will be responsible for staff relations, recruitment and training, etc. He will report to **N. F. Patterson.**

Mr. Chaloner, who for the past 12 years has been chief personnel officer, has been with Monsanto for 35 years. He is a Governor of Hendon Technical College.

Griffin and George Ltd. announce that **Dr. A. J. P. Martin,** F.R.S., has retired as a director of the company. He will be retained as a consultant and is succeeded, as Director of Research, by **R. C. Palmer,** M.A., his deputy. Mr. Palmer was born in 1912, and educated at the University of Cambridge and was formerly Director of Research of the South African Wool Industrial Research Institute.

C. P. Percy, after 45 years' service with J. M. Steel and Co. Ltd., has retired from the office of managing director, but remains chairman. **A. G. Ballard** and **H. R. Peters** have been appointed joint managing directors and **J. V. Webb** company secretary.

G. F. Ashford has been appointed deputy chairman of the Chemical Group, The Distillers Co. Ltd. **J. M. Rimington,** managing director of the Chemical Division, has retired for reasons of health after 30 years' service, and is succeeded by **J. H. Dunn. J. S. Hunter** succeeds Mr. Dunn as assistant managing director (commercial) of the Chemical Division.

E. A. Wright, F.P.S., has joined K. W. Chemicals Ltd.

William Rampton has succeeded **L. B. Saw** as company secretary of Ronuk Ltd.

J. Howlett, general manager of the Hull site of the Distillers Co. Ltd., has been appointed a Division Director of the Chemical Division of D.C.L.

Mr. Howlett has been with D.C.L. for 36 years, beginning with analytical work at the research station then located at Hammersmith. His association with the Hull factory began in 1929 when the plant constructed at Salt End by British Industrial Solvents started operation.

OBITUARY

The Wellcome Foundation Ltd. regretfully announce the death of **Dr. John Constable Broom,** an outstanding figure in tropical medicine. Born in 1902, Dr. Broom was educated at Madras College, St. Andrews, and qualified M.B., Ch.B. from University College, Dundee. In 1929 he was awarded M.D. at St. Andrews University and the Rutherford Medal.

He joined the Wellcome Bureau of Scientific Research in 1928, and was responsible for many important contributions in bacteriology and immunology. He collaborated with the late H. H. Brown in producing the device for estimating the number of bacteria in vaccines known as Brown's Opacity Tubes.

His work in charge of the Yellow Fever Inoculation Centre during the war was recognised by the award of the O.B.E.

Francis J. Curtis, former vice-president and director of Monsanto Chemical Co., St. Louis, U.S.A., died in St. Louis on April 21 the day before his 66th birthday.

Among the many appointments of distinction held by Mr. Curtis was the presidency of the Society of Chemical Industry, to which he was elected in 1952. He was also a former president of the American Institute of Chemical Engineers, and last November received the Founders' Award for his outstanding contributions to chemical engineering.

Edmond J. Boake, a director of A. Boake, Roberts and Co. Ltd., died recently aged 91. He was the son of the Founder of the business.

Company finance

Glaxo Laboratories. Trading profits for six months to December 31, 1959, were £3,181,000 (£2,418,000). Group turnover was 14% greater than the corresponding figure in 1958. Interim ordinary dividend: 7%.

Evans Medical. Group profits after all charges, including tax, for 1959 were £240,188 (£188,768). Final ordinary dividend: 4½d. per 5s. unit.

John Knight Ltd. Net profit for 1959 was £214,927 (£189,885). The soap-making activities have been transferred to Unilever, Port Sunlight, leaving Knight to develop tallows, edible oils, glues and adhesives.

Wm. Gossage. Net profit for 1959 was £195,517 (£162,699).

Joseph Crosfield. Net profit for 1959 was £1,165,203 (£887,793). The first stage of rebuilding—a new chemical plant costing £1,175,000—is complete and the second—a new technical centre costing £656,000—is scheduled to be ready by the end of 1960. The third stage will be a new soapery including automatic continuous processing; this is at the design stage.

I.C.I. profits now "more appropriate to capital"

I.C.I.'s annual report for 1959—the first to appear since Mr. S. P. Chambers became chairman—refers to the improvement in profits (£79 million against £51m.) as a welcome one, but says they have only resumed what may be regarded as a more appropriate relationship to capital in view of the heavy volume of capital investment in recent years.

During the year the company spent £32·2m. on construction projects in the U.K., compared with £45·3m. in 1958 and £50·6m. in 1957. In 1959 £22m. was sanctioned for new projects, and the amount of outstanding capital expenditure which had been sanctioned but not spent was reduced from £49·8m. to £39·6m.

The rate of capital expenditure in the earlier part of 1960 will again be less than in the preceding year, but this trend is expected to be reversed towards the end of the year.

Expenditure on research and development, including technical service, in 1959 was £14·2m., about half of which was on valuable but unspectacular improvements to existing processes and products.

New products introduced to the selling range during the year include a new range of dyes, the *Procinyls* for colouring nylons, and a new antibiotic called *Fulcin*, a fungicide which can be administered orally for the treatment of intractable fungal diseases.

In plastics widespread interest is being shown in polypropylene, and the plastics division's new plant at Wilton will come into production during 1960.

External sales of the group amounted to £508·5m., compared with £462·7m., and sales of the company to external customers and to subsidiaries, at home and abroad, advanced from £296·3m. to £321m. This rise of about £25m. would be about £36m. if organisational changes made in 1958 and 1959 were taken into account, the directors state. The group sales are not affected by these changes.

Exports of I.C.I. products from the U.K. increased by 19% to a record £87·5m. As in 1958, the main feature was a further, but larger, expansion in exports of plastics and *Terylene*. This year an important contribution was also made by the recovery in alkali and dyestuffs exports. Shipments to the Commonwealth increased by 10%. These markets continued to take the largest share of exports, and accounted for 42% of the total. There was a big rise in exports to India and also to Hong Kong.

European trade. The future effect on the company's business of the division of Europe into the European Economic Community and the European Free Trade Association is under active study. Of the total exports of I.C.I. products in 1959, £11m. went to the six Common Market countries (an increase of 25% over 1958) and £11·3m. went to the "Outer Seven" (an increase of 41%).

F. W. Berk. Group profit after tax for 1959 was £263,741 (£189,577). A final ordinary dividend of 5½d. per share, making a total of 7½d. (12½%), was declared. Last year's dividend was 10%.

£40,000 extension to Hedley Research Laboratories

Work has begun on an extension to the Longbenton Research Laboratories of Thomas Hedley and Co. Ltd. at Newcastle upon Tyne.

The extension will house the basic research department, patents department and the basic research library, all of which are now located in the development and research building adjacent to the company's Newcastle factory. The accommodation released by the removal of these departments will be occupied in due course by engineering division.

The new accommodation will consist of offices, large and small laboratories and an extension to the existing library. Construction is being carried out by Ralph Bowey and Son Ltd. at a cost of just under £40,000. The building is scheduled to be completed by October 30, 1960, and it is anticipated that all equipment will be moved in and the facilities in full operation before the end of this year.

United Glass decentralise

Two Divisions, one in England and one in Scotland, have been formed by United Glass Ltd. to effect decentralisation.

The *English Division* managing director is Mr. A. S. Railton and the *Scottish Division* managing director is Mr. P. Jones.

Hanovia gets Heraeus Agency

Hanovia Lamps Division of Engelhard Industries Ltd., Slough, has taken over the sole agency in the U.K. for the Heraeus Quarzschmelze G.m.b.h., Hanau, West Germany.

The Heraeus Company are manufacturers of high-quality fused quartz in both optical and commercial grades for industrial and laboratory applications.

A wide range of laboratory ware in both transparent and satin silica is offered, and within certain limits pieces can be made accurately to customers' own patterns.

Of particular interest is the Heraeus Bi-distillation apparatus made in two sizes of 0·4 l/h and 1·5 l/h capacity which provide in one operation pyrogen-free, double-distilled water of a degree of purity between 0·55 and $0{\cdot}9 \times 10^{-6}$ Siemens/cm.

Washtub sales boost Unilever's millions

Unilever's turnover in 1959 rose to the astonishing figure of £1,787 million, an increase of £59 million over the previous year. Consolidated net profits showed an even greater increase, from £47·2 million to £60·1 million. This was largely due to the increase in soap and detergent sales, particularly of better quality products which gave higher margins. Sales rose from 1,740,000 to 1,787,000 tons and in the U.K. *Persil* got back all the tonnage lost in 1958. *Omo* and *Surf* had a good year.

Toilet preparations continued strongly upward, particularly in the U.S., with sales of £38 million compared with £29 million in 1957. Food sales went up to £216 million (£189m.) and margarine and edible fats rose to 1,653,000 tons (1,605,000).

Crosfield's chemical business and Price's business in oleine, stearine and fatty acids made greater sales and profits in the U.K., but John Knight's tallow and glue business dropped.

Exports from the U.K., including the United Africa group, expanded from £51·87m. to £55·75m. and from the Netherlands from £31·06m. to £32·93m.

£52 million of capital projects were approved last year. They include:

Plant for the production of synthetic detergents and/or chemicals for synthetic detergents in Argentina, Germany, Malaya, S. Africa and the U.S.—£1,110,000.

New soap and detergents factory at Casablanca, Morocco—£505,000.

Expansion of toothpaste factory at Edgewater, U.S.—£325,000.

Albright and Wilson's £5m. capital programme

In 1959 the Albright and Wilson Group further increased their sales and profit. The value of sales by the Group in 1959 was £34,500,000, an increase of £2,300,000, or about 7%. In volume, sales expanded by rather more than 7%, since for some products average selling-prices, particularly in overseas markets, were lower. The value of Group sales overseas, through direct exports from the U.K. and trading by subsidiaries in Canada and Australia, amounted to about 35% of the total, approximately the same proportion as in 1958. The contribution from additional sales, together with improved operating efficiencies, generally stable raw material prices and an increase of £191,000 in investment income, constituted the main reasons for the expansion in Group profit gross, from £5,845,000 to £7,390,000. Net profit was £2,286,000, or about one-third more than in 1958.

Capital expenditure by the Group during the year amounted to £2,500,000. This was £600,000 less than was spent in 1958 and lower than forecast, mainly because of changes in the timing of expenditure on authorised projects. At the end of 1959 there were projects authorised involving future expenditure in excess of £5 million; actual contracts for capital expenditure outstanding at the end of 1959 amounted to £913,000, against £376,000 at the end of 1958. In 1960 the Group expects to spend considerably more than the £2,500,000 reported for 1959.

Of the capital expenditure in 1959, £1,400,000 was spent in the U.K., which was £200,000 more than in 1958. At Oldbury, the completion of one stage in the expansion of oil additives production capacity was followed by the commencement of a further project for expansion and for making additional products in this field. Other plants to which extensions and improvements were made included those for the production of metal-finishing chemicals, dicalcium phosphates and further organic phosphorus compounds. At Whitehaven there was expenditure on plants for detergents and for cosmetic and industrial raw materials. The proposed extension to sulphuric acid and cement manufacturing capacity at Whitehaven was delayed to allow of fuller study of the best ways for the Group to make use of the cost advantages offered by expansion on that site. Work on the project is now going ahead. Among the more important research and development projects on which money was spent in 1959 were laboratory and pilot plant facilities at Barry, and the extension to the research laboratories at Oldbury, now almost completed.

The main expenditure overseas was in Canada through the acquisition by Electric Reduction Company of Canada of a superphosphate works adjacent to the site of the phosphoric acid and sodium phosphate plants now under construction at Port Maitland, Ontario. Additions and improvements to the superphosphate plant are proceeding, along with the development of the main site; eventually the two operations will be integrated.

Monsanto in 3-D

Several hundred shareholders who came to the a.g.m. of Monsanto Chemicals Ltd., accepted an invitation from Sir Miles Thomas, the company's chairman, to accompany him on a personally conducted tour of Monsanto's three factories—with the help of 3-D colour slides. The 3-D pictures which the shareholders saw through special glasses—*not* rose-coloured, they were assured—were accompanied by a running commentary from Sir Miles who, at the end of a record year for Monsanto, was able to show his audience something of the factories and research laboratories in which these results had been achieved.

Phenol agreement "contrary to public interest"

In a reserved judgment the Restrictive Practices Court has declared that the agreement between members of the Phenol Producers' Association is contrary to public interest. The Phenol Producers' Association is a body consisting of the largest phenol producers in the U.K., which meets occasionally to discuss matters of common interest to members.

Phenol produced from coal tar acids is known as "natural phenol." That produced by synthesis from benzene is known as "synthetic phenol." The association's fixed basic price for phenol was 1s. 4d. per lb. for contracts of 10 tons and over. This was alleged to be above current world prices and higher than the price at which large sales of phenol had been made by certain synthetic producers who were not members of the association. Among the demerits of price fixing mentioned by the Court was that it was not related to the cost of production but was left to the unfettered discretion of the members.

The association maintained that there was at the moment a surplus of supply over demand which would last for five years, after which there would be a shortage. Hence, the result in a free market would be a reduction in the price of phenol from 1s. 4d. to 1s. per lb. This would so reduce the revenues of tar producers that they would have to divert from distillation of the acids to burning them as fuel, with a consequent loss of chemicals derived from coal tar.

Synthetic phenol plant at Grangemouth

The new £4 million synthetic phenol plant of British Hydrocarbon Chemicals Ltd. (jointly owned by B.P. and Distillers) is now in operation at Grangemouth. The plant has a production capacity of 13,000 tons phenol per year and consists of two units. In the first, cumene is produced by reacting benzene with propylene. In the second, the cumene is oxidised to its hydroperoxide, which is then split into phenol and acetone. This process for conversion of cumene to phenol was developed some 12 years ago by the Distillers Research Establishment. At that time manufacturing capacity in the U.K. was sufficient to meet the chemical industry's demand for phenol. As a result the process was subsequently licensed for manufacture in a number of foreign countries: Belgium, France, Canada, Germany, Italy, Japan and the U.S.A. It is estimated that by the end of next year some 200,000 tons of phenol will be manufactured annually by this method.

The new installation includes a process control laboratory and specially designed equipment for the handling of the products. Special insulated stainless steel tanks fitted with heating coils are used to transport the phenol in view of its high melting point corresponding with its purity.

Standard process vessels

The object of a new 30 pp. British Standard "Sizes of process vessels for chemical and allied industries" (B.S. 3161 : 1960) is to reduce substantially the number of differently-dimensioned process vessels, thus reducing the amount of press and other equipment required for fabrication.

The capacity and dimensions of process vessels used in the chemical and allied industries are frequently selected arbitrarily and without any consideration of standardisation. In some instances the dimensions are based on the size of charge with added space for boiling, etc., and are such that the vessel cannot be fabricated. In many cases the chosen dimensions are based on vessels made to metric sizes by continental suppliers. Thus confusion is heaped on confusion.

When vessels are made as castings it is possible and economic (within reason) to accommodate a great variety of sizes; this is because the mould is generally formed by comparatively inexpensive moulding tackle. But with the modern tendency to fabricate vessels from plate material, the cost of dies and other items for pressing to shape becomes a major charge. Standardisation is the obvious answer to this problem.

B.S.3161 specifies the dimensions of the following types of process vessel: vertical cylindrical open, vertical or horizontal cylindrical closed, and the so-called "boat" pans. The range is 5 to 5,000 Imperial gallons. In order to overcome the confusion which exists in industry regarding the names applied to process vessels, the standard includes a list of seven important terms.

Copies of this standard may be obtained from the British Standards Institution, 2 Park Street, London, W.1. Price 7s. 6d. net.

Polarographs for China

During the year ended March 31, 1960, Southern Instruments Ltd. have supplied ten of their K1000 cathode ray polarographs to a value of £8,000 to the Republic of China. The total number of these instruments now in use in China is 13.

Chemical engineers' rules revised

Regulations for admission to the classes of Graduate and Associate Membership of the Institution of Chemical Engineers have been revised in part. A revised version of the pamphlet "Regulations for the admission of Student, Graduate and Corporate Members, and for the Examination of the Institution" has been published.

The revisions are mainly concerned with the definition of qualifications which exempt completely or in part from the Institution examination. The new basis for complete exemption from the Institution examination is the satisfactory completion of an honours degree course for a first degree in chemical engineering of a British University.

Rapid growth of chemical engineers' institute

A healthy state of growth was reported by the President of the Institution of Chemical Engineers, Mr. W. K. Hutchison, C.B.E., at the annual dinner and dance held in London on April 12. He said that there were now well over 5,000 members of the Institution and this number was increasing at the rate of 600 a year. There were now over 1,500 student members, as many as the number of associate members. Mr. Hutchison said that nowhere in Western Europe was there an established system of chemical engineering education equal to the British. The rapid growth of the Institution threw a heavy burden on the General Secretary, Dr. Brennan, said Mr. Hutchison, and he paid tribute to the work of the secretary and his staff.

Mr. Hutchison was welcoming the guests, who included the Minister of Power, Mr. Richard Wood, Sir Henry Jones, Chairman of the Gas Council, Sir William Garrett, Chairman of the ABCM, and Sir Cyril Hinshelwood, President of the Royal Society.

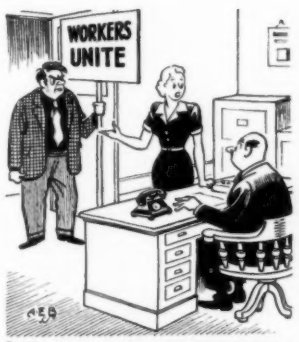
In his response to the toast to the guests proposed by the President, Sir Cyril Hinshelwood said he was particularly gratified to attend the dinner because Mr. Hutchison was a former pupil of his. "When you find tycoons among your former pupils, it makes life less terrifying," said Sir Cyril. Referring to the development of the chemical engineer over the past 40 years, Sir Cyril characterised him as a man who overcame not only the "cussedness of matter," but also the "cussedness of men." He was an interpreter between chemists and engineers. Chemists knew what was to be done and engineers how to do it. The chemical engineer bridged this gap.

Rod type pipe hangers

Engineers have evolved through the years certain basic methods of supporting and hanging pipework. By far the commonest of these is that by which the pipe is suspended from specially erected supports, or from convenient positions on adjacent structures. In this way pipework can be securely hung in any desired position, yet be quite able to accommodate itself to dimensional changes caused by thermal or other movement.

The traditional rod-type pipe hanger is too well known to need detailed description, and numerous examples of this design can be found in any factory. It is true to say, however, that many variations on the same basic theme can also be found, not only as between one installation and another, but also side by side on the same pipe. Such situations have largely arisen because no dimensional standard has existed to give guidance to the would-be user.

The Engineering Equipment Users Association has recently studied this problem and has now submitted to the British Standards Institution a document to be used as a basis for a draft British Standard for the dimensional standardisation of rod-type pipe hangers, suitable for use with mild steel and cast iron pipes, both insulated and uninsulated.



"SOMETHING SEEMS TO HAVE GONE WRONG SOMEWHERE WITH THAT ORDER FOR AN AGITATOR, SIR"

Wax consultants

Waldie and Stoger is the name of a new consultancy specialising in wax technology.

Services offered include the design of plant and equipment, processing and production control methods, technological evaluations and analyses, advice regarding raw materials, the formulations of individually designed wax compounds for specific applications, literature surveys and translations, and market surveys. The address is 120 St. Ann's Road, Prestwich, Manchester.

Cortico-steroids cheaper

The prices of cortico-steroid preparations have been reduced. Examples from Glaxo are 1s. reduction to 11s. 8d. for 50 5-mg. *Cortelan* tablets, 7s. 4d. reduction to 12s. for 100 1-mg. *Delta Cortelan* tablets, and 7s. 4d. reduction to 12s. for 100 1-mg. *Prednelan* tablets.

Examples from Merck Sharp and Dohme Ltd. are 5s. 6d. reduction to 9s. for 100 1-mg. *Codelcortone* tablets and identical reductions for *Deltacortone* and *Prednisolone*.

The Glaxo prices are retail and the M.S.D. prices are wholesale.

Disinfectant association officers

The following were elected as officers of the British Disinfectant Manufacturers Association for 1960.

Chairman: Mr. S. L. Waide, Newton Chambers and Co. Ltd.; *Vice Chairman:* Mr. J. K. Wilson, Cooper McDougall and Robertson Ltd.; *Hon. Treasurer:* Mr. V. G. Gibbs, William Pearson Ltd.

MEETINGS

The Royal Society

May 26. "Absorption spectra of low-pressure flames," by A. G. Gaydon, G. N. Spokes and J. van Suchtelen. "The effect of fluorine on the spectra and ionization potentials of molecules," by R. Bralsford, P. V. Harris and W. C. Price. 4.30 p.m. Burlington House.

Fertiliser Society

May 19. Visit to East Malling Research Station, Kent. Thirteenth Annual General Meeting.

Society for Analytical Chemistry

May 20. Joint meeting with the Physical Methods Group of the Society on "Atomic Absorption Spectroscopy." 6.30 p.m. Conference Room, Municipal Building, Poole.

May 27. Joint Summer Meeting with S.W. Section of the R.I.C. on "Trace Elements in Sea Water," by L. H. N. Cooper. Plymouth.

June 8-10. Joint meeting with Gas Chromatography Discussion Group of the Hydrocarbon Research Group of the Institute of Petroleum. Symposium on "Gas Chromatography." Assembly Rooms, Edinburgh.

Chemical Society

May 23. "Chemical Constitution and Immunological Specificity," by M. Heidelberger. 5.30 p.m. Chemistry Dept., King's College, Newcastle upon Tyne.

May 25. As above. 5.30 p.m. Physics Lecture Theatre, The University, Hull.

May 27. As above. 5 p.m. University Chemical Laboratory, Lensfield Road, Cambridge.

£10 million extensions at I.C.I. Severnside

I.C.I. is to make large additions to its plants for manufacturing ammonia and methanol and for making products from ammonia.

A new ammonia plant, with a capacity of 100,000 tons a year, and associated plants to make urea and fertilisers, will be built at I.C.I.'s Severnside works in South Gloucestershire, at a cost of upwards of £10 million. These plants are expected to start production during 1963. This is the second important project that I.C.I. has decided to locate on this new 1,000-acre Severnside site. The first, announced in February, will involve the construction of plants to make ethylene oxide and ethylene glycol, costing £5 million.

I.C.I. has also decided to extend the methanol plant at its Heysham works in Lancashire. A new plant to make 30,000 tons a year of methanol began production there only a few months ago. A further extension to make an additional 45,000 tons per year is now to be built, and is expected to be completed during 1962. Methanol is an important raw material for the plastics industry.

News from Abroad

AUSTRALIA

New colour company

Reichhold Chemical Industries (Australia) Ltd. has formed a new colour manufacturing subsidiary—Smith Reichhold Colours (Australia) Pty. Ltd.—managing director Mr. A. C. Hatrick announces.

Costs increase

During the past four years the annual increase in productivity per worker in Australia has averaged about 0·76%, but during the same period the Federal basic wage has gone up by an average annual amount of 4·25%.

INDIA

First yeast factory

The Distillers Co. Ltd. and Shaw Wallace and Co. Ltd. of Calcutta have formed the India Yeast Co. (Private) Ltd., in which D.C.L. will have a minority interest. This company is building a factory at Calcutta and will produce dried and compressed bakers' yeast, using molasses as the main nutrient material.

D.C.L., who have been producing yeast in the U.K. since about 1886, will provide technical knowledge for the design and erection of the Indian plant and for its operation, initially from the strain of pure yeast grown by the D.C.L. research laboratories. It is expected that the factory will be in production by early 1961.

At present, all yeast used by the bakers in India has to be imported under licence.

MALAYA

New Glaxo factory

Glaxo's new £115,000 factory in Petaling Jaya, near Kuala Lumpur, Malaya, is now in operation. The factory was opened recently by the Malayan Minister of Industry and Commerce.

After the opening ceremony the Minister toured the premises accompanied by the chairman of the parent company, Sir Harry Jephcott.

Work on the new factory began early last year. The plant is designed to cater for the entire pharmaceutical and infant food need of the population of the Federation and Singapore.

Towards the end of the year it is expected that the factory will be handling a full range of the company's products, including antibiotics, specialised infant foods and many pharmaceuticals, including liquid preparations, sterile injectibles and tablets for human and veterinary use.

Manager of the new factory is Mr. R. Baker, who has been with the Glaxo organisation for 12 years. Few Malayans have had previous factory experience and a training programme is in hand.

ARGENTINA

Phenol plant planned

A new jointly-owned phenol plant in Argentina is being planned by Hooker Chemical Corp. and Atanor, Compania Nacional para la Industria Quimica S.A.M., one of Argentina's largest industrial corporations. A new company, Duranor, was formed in January 1960 for this purpose.

Its establishment as a manufacturer is contingent upon successful negotiation of a substantial loan to Duranor by the Export-Import Bank of Washington, D.C., for purchase of equipment in the United States. Construction is expected to begin about July 1960 with completion less than two years later.

Duranor will have capacity to produce 25 metric tons per day of phenol by the new Hooker phenol process which is based on the Raschig process, invented by Dr. Walter A. Prahl in Germany 20 years ago. At present there is one small phenol plant in Argentina.

SOUTH AFRICA

Oral polio vaccine

It is expected that a new oral polio vaccine may be used in South Africa later this year. The vaccine is being produced in the Union at the moment, and a medical authority said "we already have enough of it to inoculate the Union tomorrow," but tests are still being made. The vaccine is being used extensively in many parts of the world, including Russia, where more than 30 million people have been inoculated successfully. The South African-made vaccine has been tried out in Mauritius and is now being tried in Kenya, but the medical authority did not think it was likely that it would be used in the Union until after the Copenhagen poliomyelitis conference, which will be held in June or July. The vaccine is a "live attenuated one," as opposed to the "dead virus vaccine" now used.

Chemicals merger

South African Druggists have acquired control of General Chemicals Ltd. The merger should provide General Chemicals with wider distribution for its products. General Chemicals, under the management of its new board, has sold its Johannesburg and Durban properties to the former joint managing directors. The book value of these two properties at June 30 was £172,122.

Sclerosis immunity research

Disseminated sclerosis—in Europe, America and Australia a common disease of the nervous system—is so rare in the Union that extensive research is now being undertaken to ascertain the factor that provides South Africans with their relative immunity. The research is

being undertaken by a Port Elizabeth medical practitioner. He is the same doctor who conducted a survey in 1948. He pointed out that American interest was stimulated by the fact that the European population of South Africa is genetically the same as in the U.S. and Australia. Their relative immunity must have been acquired after settling in the Union. "If we can find out what protects South Africans, or why the Bantu in the Union are immune, we will be well on the way to establishing the cause of the disease," he said.

UNITED STATES

$1,657 billion for production and research

Chemical production and research facilities costing an estimated $1·657 billion will be constructed in the U.S. during 1960 and 1961.

This figure includes $1·172 billion for construction already begun and $485·5 million for projects scheduled for early ground-breaking and completion before 1962.

In releasing results of its annual construction survey, the Manufacturing Chemists' Association announced that projects with a collective price tag of approximately $1·344 billion were completed in 1959. This brings total construction costs for the three-year survey period (1959-61) to an estimated $3·002 billion.

All projects are privately financed.

Each annual survey moves the three-year period up one year.

The record total of $3·84 billion for a three-year survey period was listed in the results released in 1958. Last year the total was $3·293 billion—more than $291 million over this year's figure.

A total of 290 projects being carried out by 149 companies in 198 communities of 39 states accounts for the $1·172 billion in construction already under way.

The Planned Construction, to be completed before 1962, includes 151 projects in 126 communities of 34 states at a cost of $485 million to 87 firms.

In the category of Completed (1959) Construction, the $1·344 billion total is composed of 379 projects by 205 companies in 270 communities of 42 states.

The continued upswing in announced expenditures for the construction of new laboratories is considered especially significant.

Evans' appointments

The election of two new vice-presidents, Dr. Murray Berdick and Dr. William E. Holland, was announced recently by Dr. Ralph L. Evans, president of Evans Research and Development Corporation, the New York City independent industrial research laboratory. Dr. Evans said this resulted from the continual expansion and diversification of the activities and facilities of Evans Research.

Borate mine extensions

Continuing the $20 million expansion programme inaugurated in 1956, United States Borax and Chemical Corporation, American operating company of Borax (Holdings) Ltd., are to install a 1,300 feet mechanised conveyor system at the open pit borate mine at Boron, California. Work on the project is due to start in May and will be completed in the autumn.

The borate deposits at Boron are the largest and richest in the world, and at present the open pit measures 2,000 ft. long, 1,700 ft. wide and 275 ft. deep. In view of rumoured world shortages it is reassuring to know that the expanding production facilities of the Borax (Holdings) Group ensure ample capacity.

Cosmetic award

The 1960 Special Award of the Society of Cosmetic Chemists and its prize of $1,000 will be presented to Dr. Aaron Lerner in recognition of his work on enzymes and hormones controlling skin pigmentation. Dr. Lerner, a professor at Yale University School of Medicine, is considered to be a pioneer in the study of melanin and was instrumental in the isolation of two melanocyte stimulating hormones from hog pituitaries. His work also demonstrated the similarity of these hormones obtained from man to that obtained from other species.

Actinomycin v. cancer

Scientists from France, West Germany, Great Britain and Czechoslovakia conferred with U.S. scientists in New York recently about a 20-year-old drug which is taking a minor but active part in the fight against cancer and may yet play a larger rôle.

The drug is actinomycin—actually a complex of half a dozen compounds—and it was first isolated in 1940 when Dr. Selman Waksman had just started to look for germ-killing activity among soil organisms. The two-day conference, sponsored by the New York Academy of Sciences, heard reports on the usefulness of actinomycin from such cancer research centres as Children's Hospital, Boston; Roswell Park Memorial Institute, Buffalo; and Sloan-Kettering Institute, New York. Actinomycin IV is made for U.S. researchers by Merck Sharp and Dohme. Variations of the actinomycin molecules are being made by Farbenfabriken-Bayer in Germany.

The aim is to reduce the toxicity of the drug to levels that will permit its known anti-tumour capacities to save more lives than the very few it now saves. In hospitals, physicians are using radiation to enhance the compound's anti-tumour action. This clinical research is also seeking better ways to administer it. The drug is too irritating to tissue for injection into muscle, but can be given by vein and sometimes by mouth.

Since the first isolation of a streptomyces that would produce actinomycin, at least 11 other species of the microbe have been identified which make actinomycin in various forms.

Seven chemical forms are known. American investigators have been especially interested in actinomycin D or IV, German scientists in actinomycin C or III. At the conference chemists discussed new forms of actinomycin showing two- to one hundred-fold reductions in the drug's toxicity. Others described the way it attacks growing cells (showing particularly effective action in the lymph system—spleen, thymus gland and lymph nodes).

ITALY

Propylene oxide plant

A plant for making propylene oxide and derivatives will be constructed and operated by S.p.A. Celene, a company formed in 1957 and jointly owned by Union Carbide of U.S.A. and Societa Edison. It will have an initial capacity of 25 million lb. (11,400,800 kg.) of propylene oxide p.a. and it will be built at Priolo, Sicily, adjacent to Celene's other production facilities.

Celene's polyethylene plant is already on stream and it is now being expanded to a capacity of approximately 65 million lb. (29,500,500 kg.) of polyethylene annually. Celene are also building at Priolo facilities for the production of solvents and plasticisers, with capacity of 70 million lb. (31,800,500 kg.) p.a.

NEW COMPANIES

These particulars of new companies have been extracted from the daily register of Jordan and Sons Ltd., company registration agents, Chancery Lane, London, W.C.2.

Wellesbourne Pharmacy Ltd. 10.2.60. Kineton Road, Wellesbourne, Warwick. £100. Dirs.: Ronald D. A. Fearnett and John C. Hatfield.

L. Stevenson (Chemists) Ltd. 21.1.60. 42 Bedford Avenue, London. W.C.1. £1,000. Dirs.: W. H., A. W., and B. H. Green.

Barnes Chemist Ltd. 29.1.60. 24 Cheshire St., Market Drayton, Salop. £1,000. Dirs.: Gerald T. and Margaret Barnes.

F. Brayshaw and Son Ltd. 29.1.60. Junction Mills, Laisterdyke, Bradford, 4. Dlrs. in fine and heavy chemicals, etc. £3,000. Dirs. to be apptd. Sub.: Frank Brayshaw.

Mason and Son (Chemists) Ltd. 2.2.60. 6 Silver Street, Whitwick, Leics. To take over bus. of a chemist, etc., cd. on as "A Mason" at Whitwick. £2,000. Dirs. to be apptd. Sub.: Albert Mason, 6 Silver Street, Whitwick, Leics.

Benwall Pharmacies Ltd. 2.2.60. 120 Baker Street, London, W.1. £1,000. Dirs.: Brian and M. Bernstein.

Spinet (Cosmetics) Ltd. 2.2.60. 49 Kingston Road, Leatherhead, Surrey. £100. Dirs.: Ashe Laboratories Ltd., 49 Kingston Road, Leatherhead, Surrey.

Pertec Ltd. 2.2.60. 49 Corporation St., St. Helens. Mnfrs. of and dlrs. in chemicals, etc. £1,000. Dirs.: C. R. Pearce, S. Hall.

THE CHEMICAL MARKET

PRICES HIGHER THIS MONTH

LONDON.—The general trend in prices this month is up: citric acid, tartaric acid, zinc oxide, calcium chloride, formaldehyde, sodium silicate, n-butyl alcohol, caustic soda and methylated spirits are dearer. Ethyl, potassium and sodium iodides, dimethyl sulphate and n-butyl acetate are cheaper. There are the usual fluctuations in oils and waxes. We regret a mistake in the price of **pentachlorphenol** last month. The price was not changed and remains at 2s. 2d. lb.

FINE CHEMICALS

Acetanilide 12½ kg. 7s. 4d. kg.
Arsenic trioxide
5—10 ton lots £35 ton
Ascorbic acid
100 kg. £4 14s. kg.
Aspirin
56 lb. 5s. 2d. lb.
1-cwt. 4s. 8d. „
5-cwt. lots 4s. 10d. „
Atropine
Sulphate, 500 g. £59 18s. 6d. kg.
Alkaloid, 500 g. £68 15s. kg.
Benzene B.P.C. 28-lb. lots 1s. 8d. lb.
Benzoic acid 12½ kg. 7s. 4d. kg.
Benzyl benzoate
According to pack 4s. 11d. to 7s. 2d. lb.
Bismuth oxide B.P.C. 1934
28-lb. lots 26s. 10d. lb.
Bismuth salts 28-lb. lots:
Carbonate 22s. 3d. lb.
Subgallate 21s. 1d. „
Salicylate 21s. 9d. „
Subnitrate 20s. 5d. „
Borax B.P.
Powder £60 10s. ton
Extra fine £61 10s. „
Boric acid B.P.
Crystal £99 „
Powder £96 10s. „
Bromine B.P.C. 7-lb. lots 6s. lb.
Caffeine 50 kg. 42s. 6d. kg.
Calamine 50 kg. 4s. kg.
Calcium gluconate
1 cwt. lots dlvd. 3s. 7d. lb.
Calcium glycerophosphate
50 kg. 28s. 6d. kg.
Calcium lactate B.P.
7-lb. lots 2s. 11d. lb.
1-cwt. lots 2s. 4d. „
Chloral hydrate 50 kg. 10s. kg.
Citric acid, B.P. Powder or granulated:
1-cwt. lots in bags 212s. cwt.
5-cwt. lots „ „ 208s. „
Codeine
Alkaloid 100 g. £138 10s. kg.
Phosphate 100 g. £110 „
Cream of tartar
1-cwt. lots £12 5s. cwt.
5-cwt. lots £12 3s. „
Ephedrine
Hydrochloride 3 kg. £7 1s. 1d. kg.
Alkaloid 3 kg. £12 7s. „
Sulphate 3 kg. £7 1s. 1d. „
Eucalyptol
1-cwt. lots 11s. lb.
5-cwt. lots 10s. 6d. „
Ferri ammonium citrate B.P.
1-cwt. lots, scales 4s. 5½d. lb.
1-cwt. lots, granules 3s. 7½d. „
Ferrous gluconate
1-cwt. lots dlvd. 6s. 3d. lb.
Gallic acid B.P.C.
1-cwt. lots 10s. „
Gluconic acid technical 50%
Minimum 12-gal. drums
19s. gal., drums extra, returnable
Glucono delta lactone
1-ton lots dlvd. 5s. net lb.
Glycerophosphoric acid
24 litres 11s. 10d. litre
Glycine (amino acetic acid)
12½ kg. 18s. 10d. kg.
Hexyl resorcinol 10 kg. £7 10s. „
Hydroquinone 12½ kg. 23s. 10d. „
Iodides
Ethyl 4 kg. bottles 61s. 4d. kg.
Mercury, red B.P.C.
12½ kg. lots 59s. „
Potassium B.P.
12½ kg. lots 14s. 9d. „
Sodium B.P.
12½ kg. lots 21s. 6d. „
Iodine, Chilean crude,
99% min. in wooden casks 15s. kg.
Iodoform
12½ kg. and under 50 kg. 42s. 6d. kg.
Lactose 50 kg. 3s. 2d. kg.
Lithium salts 5-cwt. lots
Benzoate 10s. lb.
Carbonate B.P.C. 11s. 3d. „
Chloride (commercial) powder
11s. „
„ granular 10s. 9d. „
Hydroxide 9s. 9d. „
Citrate B.P.C. 9s. „
Sulphate 8s. 6d. „
Salicylate, 10 cwt., dlvd. 9s. 9d. „
Magnesium carbonate B.P.
Light cwt. lots dlvd. £129 ton
Magnesium trisilicate 28-lb. packs
28-lb. lots 4s. 3d. lb.
1-cwt. lots 3s. 10d. „
5-cwt. lots 3s. 7d. „
Bulk rates for larger quantities are from 3s. 1d. lb. in 1-ton lots
Manganese hypophosphite B.P.C.
7-lb. lots 13s. 11d. lb.
1-cwt. lots 12s. 11d. „
Mercuric chloride B.P.
50-kg. lump 48s. 6d. kg.
Methyl salicylate 1-cwt. lots 3s. 3d. lb.
Morphine
Alkaloid, 100 g. £138 18s. 4d. kg.
Nicotinamide 1 kg. £2 16s. 6d. kg.
Nicotinic acid
12½ kg. 33s. 9d. kg.
1 kg. 36s. „
Oleine, B.P. extra pale, 3/4 cwt. drums returnable carriage paid G.B.
£160 ton
Phenolphthalein 50 kg. 24s. 3d. kg.
Phosphoric acid B.P.
(s.g. 1·750) 10-carboy lots 1s. 4d. lb.
Potassium permanganate B.P.
1-cwt. lots dlvd. 1s. 11¼d. lb.
Procaine hydrochloride (foreign)
2 kg. 59s. kg.
Quinine 1-oz. lots 4s. 4d. oz.
Riboflavin
100 g. 5½d. g.
10 g. 7d. „
Saccharin
500 g. £7 4s. for this quantity
Salicylic acid
B.P., dlvd. 3s. 2½d. to 5s. 6d. lb.
Silver nitrate
500 g. 5s. 1$\frac{11}{16}$d. oz.
Sodium benzoate B.P.
1 cwt. lots 2s. 9½d. lb.
1-ton lots 2s. 7½d. „
Sodium gluconate technical
3-cwt. lots dlvd. 3s. net lb.
Sodium salicylate
50 kg. 8s. 8d. kg.
12½ kg. 9s. „
Sodium thiosulphate
Crystals, photographic quality
1-ton lots 49s. cwt.
Stearic acid B.P.C. flake, carriage paid G.B. £154 ton
Strychnine 25 oz.
Alkaloid 11s. 3d. oz.
Hydrochloride 11s. 3d. „
Sulphate 10s. 3d. „
Sulphaguanidine
12½ kg. 33s. kg.
50 kg. 32s. „
Sulphanilamide
12½ kg. 16s. 6d. kg.
50 kg. 15s. 4d. „
Sulphathiazole 12½ kg. 39s. 9d. „
Tannic acid B.P. Levis
1-cwt. lots 10s. lb.
Tartaric acid, B.P.
Powder or granulated,
10 cwt. or more £15 15s. cwt.
Terpineol B.P.
40-gal. drums 2s. 4½d. lb.
1-cwt. lots 2s. 7d. „
Theophylline B.P.
500 g. 27s. 6d. for this quantity
Thiamine hydrochloride
100 g. 4d. g.
1 kg. £11 15s. kg.
Thioglycollate
Ammonium 12s. 4d. to 16s. 4d. lb.
Calcium:
7-lb. lots 17s. 3d. „
5-cwt. lots 14s. 3d. „
α-Tocopherol 25-g. lots 11d. g.
Vanillin 23s. 6d. to 30s. 6d. lb.
Zinc oxide B.P.
2-ton lots dlvd. £115 ton

GENERAL CHEMICALS

Acetic acid 1-ton lots dlvd.
80% Technical £99 ton
80% Pure £105 „
Glacial B.P. £114 „
99-100% Glacial £111 „
98-100% Glacial £108 „

Acetic anhydride
1-ton lots dlvd. £128 ton

Acetone
5-gal. drums, free, non-returnable £128 ton
40 to 45-gal. drums, 10-ton lots £88 „

Alum, potassium granular crystals
50 kg. 1s. 2d. kg.

Aluminium hydroxide B.P.C. 34
28-lb. lots 2s. 4d. lb.

Aluminium stearate
(Precipitate) 1-ton lots £253 10s. ton

Ammonia
Persulphate £6 13s. 6d. cwt.
Phosphate: Mono- £106 ton
Di- £97 10s. „

Amyl acetate
B.S.S. 10 tons and over £251 ton
Technical £249 „

Amyl alcohol
Technical in 1-ton lots £256 ton

Arsenic White powdered ex store £42 ton

n-Butyl acetate
10-ton lots £165 ton

n-Butyl alcohol
10-ton lots £137 10s. ton

Calcium chloride
Solid and Flake, dlvd. in 1 ton lots £20 ton

Calcium oxide (Lime)
Ex marble 28-lb. lots 3s. 10d. lb.

Caustic soda
Solid in drums, dlvd. £37 16s. 6d. ton
Flake 3¼ cwt. lots £39 0s. 6d. ton

Chloroform B.P. ½-ton lots 2s. 11½d. lb.

Chromic acid
Dlvd. U.K. (less 2½%) 2s. 0½d. to 2s. 0¾d. lb.

DDT 3s. 0½d. to 3s. 2d. lb.

2 : 4-Dichlorophenoxyacetic acid
99% pure, 1-cwt. bags £320 ton

Dimethyl sulphate 440 lb. drum lots 1s. 8d. lb.

Ether (Diethyl ether)
Tech. B.S.S. and Solvent B.P.
1-ton lots in drums 2s. lb.

Ethyl acetate 10-ton lots £137 ton

Ethyl alcohol
95% Gay Lussac 66·0 o.p.
over 300,000 proof gallons per year in tank wagons
4s. 0¾d. per proof gal.

Ferrous sulphate 50 kg. 1s. 4d. kg.

Formaldehyde
40% by volume dlvd. England
1-ton lots £39 15s. ton

Glycerin
1·2627 s.g. chem. pure, 5 tons and up, 5-cwt. drums £241 10s. ton
1·2627 s.g. technical grade, 5 tons and up, 5-cwt. drums £236 10s. ton

Hexamine
1-ton lots
Technical, bulk 1s. 7¼d. lb.
B.P.C. 1s. 10¼d. lb.

Hydrochloric acid
Commercial 18s. 6d. cwt.

Hydrogen peroxide
27·5% weight £115 ton
35% weight £138 „

Lactic acid (1-ton lots)
Pale tech. 44% by weight 1s. 3¼d. lb.
Dark tech. 44% by weight 9¼d. lb.

Magnesium chloride
Solid (ex wharf): 1-ton lots £18 10s. ton

Magnesium sulphate £15 ton

Mercurous chloride (calomel)
50 kg. 65s. kg.

Mercury sulphide, red
Ton lots and over 30s. 6d. lb.

Methylated spirits (Industrial)
Perfumery quality 500 gal. and upwards: gal.
64 o.p. 7s. 4d.
74 o.p. 7s. 11d.
5 to 10 gal.:
64 o.p. 8s. 7½d.
74 o.p. 9s. 2½d.

Methyl ethyl ketone
10 tons dlvd. in drums £134 10s. ton

Methyl isobutyl carbinol
10 tons and up, in drums, dlvd. £163 ton

Naphthalene
Crystal, dlvd., 4-ton lots, spot £66 ton
Ball and flake (ditto) £86 15s. „

Nickel sulphate
dlvd. ton lots £189 ton

Nitric acid 70% intermediate £36 ton

Pentachlorphenol
Flake, technical, in 100 lb. fibre/steel kegs dlvd. 2s. 2d. lb.

Phenol Ice crystals:
Under 1 ton dlvd. from 1s. 7d. lb.
10 tons and over dlvd. in returnable drums from 1s. 4½d. lb.

Phthalates
10-ton lots in drums
Diethyl (B.S.) £187 10s. ton
Dimethyl (B.S.) £179 ton

Potassium bromide
50 kg. 5s. 6d. kg.
12½ kg. 5s. 8d. „

Potassium carbonate
Calcined 96 to 98% (1-ton lots ex store) in bags £75 10s. ton
Hydrated (1-ton lots) £73 10s. „

Potassium fluoride
28-lb. lots 5s. 1d. lb.

Potassium sodium tartrate
5-cwt. lots £10 cwt.

Soda ash
1 ton lots non-returnable bags £19 6s. 6d. ton

Sodium hydroxide 28-lb. lots:
sticks (1-lb. bottles) 4s. 3d. lb.
pellets „ „ 3s. 9d. „

Sodium metal 28 lb. lots 3s. 8d. „

Sodium metasilicate
Dlvd. U.K. in ton lots £26 ton

Sodium phosphate
Dlvd. ton lots: Di-sodium, crystalline £40 10s. ton
Anhydrous £88 „
Tri-sodium, crystalline £39 „
Anhydrous £86 „

Sodium silicate
dlvd. in drums £17 ton

Sodium sulphate Ex works:
(Glauber salt) £13 ton
(Salt cake) unground, full truck loads £8 16s. 6d. ton

Sodium sulphide
Broken, returnable drums, dlvd. ton lots £37 2s. 6d. ton
Flake, ditto £38 12s. 6d. „
Solid ditto £36 2s. 6d. „

Sodium sulphite
Commercial crystals 50 kg. lots 1s. kg.
(Dlvd. London in 1-cwt. single non-returnable bags)

Sodium tripolyphosphate
1-ton lots £95 ton

Stannic chloride 28-lb. lots 8s. 11d. lb.

Stannous chloride 28-lb. lots 9s. 5d. lb.

Strontium carbonate
96-98% 28-lb. lots 3s. lb.

Sulphuric acid, ex-works, according to quality and quantity
B.O.V. 78% from 8s. to 10s. cwt.
C.O.V. 96% from 11s. to 14s. cwt.

Zinc chloride
28-lb. lots sticks 6s. 9d. lb.

OILS AND FATS

Palm kernel oil
Refined, deodorised, 2-ton lots, naked, ex-works £135 ton

Palm oil
Refined, deodorised, 2-ton lots, naked, ex-works £102 ton

Stearine
dlvd. free bags
Pristerene 64 flake £148 ton
Pristerene 62 flake £133 „
Pristerene 61 flake £113 „
A premium of £2 ton is charged for powder and £4 for block

GUMS AND WAXES

Agar Agar No. 1
Kobe strip 15s. 6d. lb.
Powder £1 „

Beeswax
Dar-es-Salaam spot (nominal) £26 cwt.
Sudan spot (duty paid) £24 10s. „
Bleached white (slab) £29 10s. „
Refined yellow (slab) £26 10s. „

Benzoin
Sumatra spot £26 10s. cwt.
Siam spot £2 7s. 6d. lb.

Candelilla Spot £23 15s. cwt.

Carnauba
Prime, Spot £44 10s. cwt.
Fatty grey £29 15s. „

Gum arabic Lump £9 5s. cwt.

Karaya Powder, Spot 3s. 8d. lb.

Paraffin wax
1-ton lots, acc. to grade £105 to £130 ton

Peru balsam 10s. lb.

Shellac
No. 1 orange £14 cwt.
No. 2 orange £12 10s. „
Transparent white 4s. 3d. lb.
Pale dewaxed 6s. „

Tragacanth
No. 1 spot £140 cwt.
No. 2 spot £122 „
Pale leaf £51 „
Amber £38 „
Brown to Red £27 „

NEW TRADE MARKS

APPLICATIONS

Pharmaceuticals

CORAVIT.—775,258. *H. and T. Kirby and Co. Ltd.*

GONADOTESTYL.—786,983. *Société de l'Institute de Sérotherapie Hémopoietique S.A.*

TREE OF LIFE.—788,002. *Carnegies of Welwyn Ltd.*

FLURYMAL.—792,418. *Schering A.G.*

ENTRUMYCIN.—792,946. *Beecham Research Laboratories Ltd.*

ULTROMYCIN.—792,970. *Beecham Research Laboratories Ltd.*

MUVAX.—793,082. *Willows Francis Ltd.*

LIDODURAL.—796,418. LIDOTOX.—796,419. LIDOSAN.—796,420. LIDOMIN.—796,421. LIDOTIN.—796,422. *Willows Francis Ltd.*

TARACTAN.—796,828. *Roche Products Ltd.*

LOZETS.—796,920. *Bayer Products Ltd.*

DONNATAL.—779,813. DONNAGEL.—779,814. *A. H. Robins Co. Ltd.*

VIVITA.—771,601. *Aksjeselskapet Tungen Gord.*

MELIXIR.—791,766. *Howard Lloyd and Co. Ltd.*

RHINAMIDE.—792,445. *Bailly Ltd.*

POLYBRENE.—793,187. *Abbott Laboratories Ltd.*

SILKY-BAC.—B793,520. *C. H. Boehringer Sohn.*

DEWFRESH.—B794,263. *D.D.D. Co. Ltd.*

ALMACARB.—794,866. *British Drug Houses Ltd.*

CELVEN.—795,229. *I.C.I.*

MEPROZAL.—796,978. *I.C.I.*

MINULES.—797,492. *Boots Pure Drug Co. Ltd.*

FEMCHETS.—797,037. MALCHETS.—797,038. *J. and J. Ballard.*

FORISTAL.—797,814. PRISMELIN.—797,816. *Ciba Ltd.*

SIPLOVAX.—797,852. *Willows Francis Ltd.*

MULTRATE.—797,853. *Gedeon Richter (Great Britain) Ltd.*

Cosmetic and toilet preparations

MINERS WHITE LIGHTENING.—790,586. *Miners Make Up Ltd.*

BALDAQUIN.—792,380. *Etablissements D. Porthault.*

LE GALION.—792,737. *Le Galion S.A.*

NEW PATENTS

COMPLETE SPECIFICATIONS ACCEPTED

Steroids

Steroid compounds and the preparation thereof. *C. Pfizer and Co. Inc.* 831,073.

Process for the preparation of steroid compounds. *C. Pfizer and Co. Inc.* 831,256.

Δ' Steroids and their preparation by a microbiological process. *Merck and Co. Inc.* 830,921.

Miscellaneous

Benzene sulphonyl ureas. *C. F. Boehringer and Soehne G.m.b.H.* 831,044.

Substituted phenols. *Merck and Co. Inc.* 830,822.

Production of alkylaluminium sesquichlorides. *Chemische Werke Hüls A.G.* 830,884.

Process for the preparation of β-piperidinoethyl-α^1-phenyl-α-piperidine-acetate and its dihydrochloride. *Laboratoires Dausse.* 830,869.

Method of producing amino-borines. *Kali-Chemie A.G.* 830,768.

Production of hydrogen peroxide. *E. I. du Pont de Nemours and Co.* 831,036.

Process for the manufacture of tetrahydro-furfuryl-ammonium compounds. *F. Hoffmann-La Roche and Co. A.G.* 830,866.

Process for the production of hydroxylamine sulphate solutions. *W. Veb. Leuna Werke Ulbricht.* 830,419.

Aminoguanidine derivatives and their preparation. *Imperial Chemical Industries Ltd.* 830,916.

Amido-phosphoric acid derivatives. *Farbenfabriken Bayer A.G.* 830,800.

Process for the production of water soluble acids having a dissociation constant of less than $10^{-2.5}$ from their sparingly soluble salts. *Chemische Fabrik Budenheim A.G.* 831,055.

Disulphonamides and compositions containing them. *Merck and Co. Inc.* 830,821.

Production of polychlorobenzene compounds. *Heyden Newport Chemical Corporation.* 831,051.

Production of derivatives of phenothiazine-10-carboxylic acid esters and their decarboxylation products and esters of 3-halogen-phenothiazine-N-carboxylic acids with amino alcohols. *Badische Anilin- & Soda-Fabrik A.G.* 831,091.

Purification of collagen. *A. Bloch, and I. B. Oneson,* 831,124.

Glutaconimides and their process of preparation. *Chimie et Atomistique.* 831,366.

α, α bis (chlorophenyl) alkanols. *Metal and Thermit Corporation.* 831,421.

Process for the manufacture of pyridine and quinoline carboxylic acids. *Ciba Ltd.* 831,561.

Preparation of 3 : 3^1 5 : 5^1-tetraalkyldiphenoquinones. *Ethyl Corporation.* 831,356.

Process for the preparation of organic phosphorus compounds. *Metal and Thermit Corporation.* 828,746.

Process for the production of 3-ketotetrahydrofuran. *Distillers Co. Ltd.* 829,886.

Preparation of zinc. *Horizons Inc.* 829,899.

Alcoholates of aluminium and a process for the production thereof. *Asta-Werke A.G.* 829,932.

Esterification of pyridine carboxylic acids. *Abbott Laboratories.* 829,889.

Process of producing terephthalic acid mono-(β-hydroxy ethyl) ester and its metal salts. *Imhausen Werke G.m.b.H.* 829,887.

Dehydrogenation of gaseous hydrocarbons *Farbenfabriken Bayer A.G.* 829,760.

Thianaphtheno-indols. *Ciba Ltd.* 830,223.

Process for the manufacture of 2 : 2′-dipyridyl. *Imperial Chemical Industries Ltd.* 829,838.

Chloroalkylation of aromatic organic compounds. *Bergwerksverband G.m.b.H., formerly Bergwerksverband zur Verwertung von Schutzrechten der Kohlentechnik G.m.b.H.* 830,052.

Benz thiazole amides. *Ilford Ltd.* 829,832.

Alicyclic lactones and a method of preparing them. *M. Protiva and J. O. Jilek.* 830,082.

Production of lactams from oxime hydrochlorides. *Badische Anilin- & Soda-Fabrik A.G.* 830,630.

Method for the preparation of di-amine-N-N′-bis-phosphoric and thionophosphoric acid derivatives. *J. A. Benckiser G.m.b.H.* 830,714.

Method for preparing sodium aluminium hydride. *Metal Hydrides Inc.* 830,717.

New patents are from the *Journal of Patents*, and new trade marks are from the *Trade Marks Journal*. In each case permission to publish has been given by the controller of Her Majesty's Stationery Office. Each of the publications mentioned is obtainable from the Patent Office, 26 Southampton Buildings, London, W.C.2.

Manufacturing Chemist's **ENQUIRY BUREAU**

Leonard Hill House, Eden Street, London, N.W.1.

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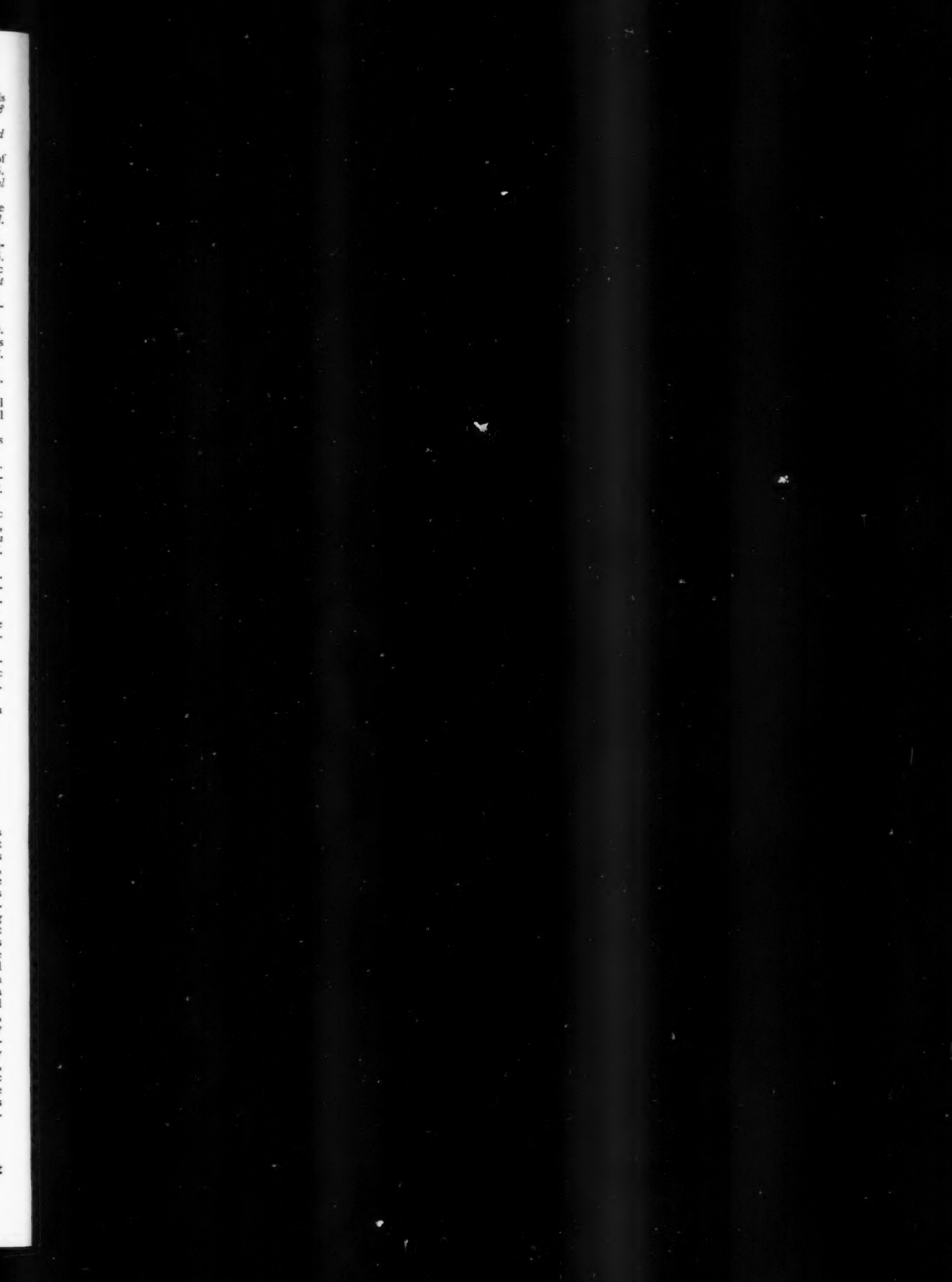
For office use. *No.* *Date.*

Sixty-Five Years Ago

From MANUFACTURING CHEMIST May 1895

The Sterilisation of Water

Boiling now is frequently practised as a sanitary measure and there is no doubt but that it is a great safeguard against diseases of a certain class. Unfortunately, however, the gases contained in natural water are thus driven off and the liquid becomes insipid, or worse still, contracts a disagreeable taste or odour from the cooking of the contained bacteria. People do not realise that the matter of this character is often present in amounts sufficiently large to be easily appreciable after prolonged heating. Many drinking waters in use in Canada contain as many as 1,000 bacteria per cu. centimetre and are still considered potable; but even when only 100 are present, the number in, say, a tumblerful, is very large, amounting to about 28,000. M. Fremont of Paris has lately proved that by maintaining water for twenty minutes at, say, 80°C. (176°F.) all the pathogenic microbes it may have contained will be destroyed, without any loss of the gaseous contents of the water and without modification of its flavour.